

XB
U812
H 464
1588

Platanaceae through Myricaceae of New York State

RICHARD S. MITCHELL
New York State Museum

LIBRARY

OCT 3 1988

NEW YORK
BOTANICAL GARDEN

Contributions to a Flora of New York State VI
Richard S. Mitchell, Editor

1988

Bulletin No. 464

New York State Museum

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Albany, New York 12230

Digitized by the Internet Archive
in 2017 with funding from
IMLS LG-70-15-0138-15

<https://archive.org/details/bulletinnewyorks4641newy>

Platanaceae through Myricaceae of New York State

**RICHARD S. MITCHELL
New York State Museum**

ISSN 0278-3355
ISBN 1-55557-177-8

**Contributions to a Flora of New York State VI
Richard S. Mitchell, Editor**

1988

Bulletin No. 464

New York State Museum

**The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Albany, New York 12230**

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University

MARTIN C. BARELL, <i>Chancellor</i> , B.A., I.A., LL.B.	Muttontown
R. CARLOS CARBALLADA, <i>Vice Chancellor</i> , B.S.	Rochester
WILLARD A. GENRICH, LL.B.	Buffalo
EMLYN I. GRIFFITH, A.B., J.D.	Rome
JORGE L. BATISTA, B.A., J.D.	Bronx
LAURA BRADLEY CHODOS, B.A., M.A.	Vischer Ferry
LOUISE P. MATTEONI, B.A., M.A., Ph.D.	Bayside
J. EDWARD MEYER, B.A., LL.B.	Chappaqua
FLOYD S. LINTON, A.B., M.A., M.P.A.	Miller Place
SALVATORE J. SCLAFANI, B.S., M.D.	Staten Island
MIMI LEVIN LIEBER, B.A., M.A.	Manhattan
SHIRLEY C. BROWN, B.A., M.A., Ph.D.	Albany
NORMA GLUCK, B.A., M.S.W.	Manhattan
THOMAS R. FREY, A.B., LL.B.	Rochester
JAMES W. MCCABE, SR., A.B., M.A.	Johnson City
ADELAIDE L. SANFORD, B.A., M.A., P.D.	Hollis

President of The University and Commissioner of Education

THOMAS SOBOL

Executive Deputy Commissioner of Education

ROBERT J. MAURER

Deputy Commissioner for Cultural Education

CAROLE F. HUXLEY

Assistant Commissioner for the State Museum

MARTIN E. SULLIVAN

Director, Division of Research and Collections

PAUL J. SCUDIERE

Chief Scientist, Biological Survey

NORTON G. MILLER

State Botanist

RICHARD S. MITCHELL

The State Education Department does not discriminate on the basis of age, color, religion, creed, disability, marital status, veteran status, national origin, race, or sex in the educational programs and activities which it operates. Inquiries concerning this policy of equal opportunity and affirmative action should be referred to the Department's Affirmative Action Officer, Education Building, Albany, NY 12234. Phone (518) 474-1265.

PREFACE

OUR GOAL in producing this series is to present a useful and authoritative account of the plants of New York State. These contributions are intended to reflect the knowledge and taxonomic opinions of specialists who prepare the manuscripts while following a generalized format for consistency. Inclusion of ecological, distributional, medical and economic information on each species is also one of our major aims. Habitat references, flowering times, pertinent synonymy, etc., often apply specifically to New York plants rather than to the entire species. Complete illustration should facilitate identification of specimens for those who are not formally trained in botany. Descriptions are original, ordered and as complete as possible to provide sequential cross-referencing.

Distribution maps accompany species of seed plants, ferns, mosses, lichens and some groups of fungi. These are plotted by counties to eliminate pinpointing endangered habitats, while offering an accurate visual picture of past collecting. Maps are based on the master file at the New York State Museum, Albany, and supplemented by available data (specimens examined by the authors) from herbaria housing significant New York collections. Data or literature citations for any map may be obtained, on approval, from the Museum.

We hope that these bulletins will serve individuals with interest in the flora, as well as to provide information for state and federal agencies, conservation organizations, industry and the scientific community. With these works go our hopes for the preservation and wise use of a precious and lifegiving resource—our State's plantlife.

The New York State Flora Committee

The steering council of the New York State Flora Committee met for the first time on January 19, 1976, and established as its goals the promotion of study of the State's plant resources and the publication of this series of museum bulletins. These contributions will be continually updated after publication for possible incorporation into larger volumes at a later date.

Members of the council at the time of this publication are:

Richard S. Mitchell, Chairman, State Botanist, N. Y. State Museum, Albany (Vascular Plants)

Charles J. Sheviak, Curator of Botany, N. Y. State Museum, Albany (Vascular Plants)

Norton G. Miller, Chief Scientist, N. Y. State Biological Survey, Albany (Bryophytes)

Clark T. Rogerson, The New York Botanical Garden, Bronx (Fungi)

George J. Schumacher, Biology Dept. SUNY, Binghamton (Algae)

CONTENTS

	PAGE
Preface	iii
The New York State Flora Committee	iii
Acknowledgments	v
Important Note	v
Legend	vi
Platanaceae	1
<i>Platanus</i>	1
Hamamelidaceae	3
<i>Liquidambar</i>	4
<i>Hamamelis</i>	5
Ulmaceae	7
<i>Ulmus</i>	7
<i>Celtis</i>	16
Cannabaceae	17
<i>Cannabis</i>	18
<i>Humulus</i>	21
Moraceae	24
<i>Broussonetia</i>	25
<i>Maclura</i>	24
<i>Morus</i>	27
Urticaceae	30
<i>Boehmeria</i>	30
<i>Laportea</i>	32
<i>Parietaria</i>	33
<i>Urtica</i>	35
<i>Pilea</i>	38
Juglandaceae	41
<i>Juglans</i>	41
<i>Carya</i>	46
Myricaceae	57
<i>Comptonia</i>	57
<i>Myrica</i>	59
Appendix I. (Associated Fungi)	62
Appendix II. (Associated Insects)	78
Bibliography	88
Index	97

ACKNOWLEDGMENTS

The illustrations in this treatment are by Deborah Morrison Dean. The appendices on insects and fungi are by J. Kenneth Dean, with reviews by Timothy McCabe (insects), Clark Rogerson and John Haines (fungi), to whom I offer my thanks. My appreciation also goes out to the steering committee for their help. Thanks to Ken Dean, Chuck Sheviak, Tom Rosatti and Gordon Tucker for suggestions on the manuscript. I would like to express my gratitude to the staffs and curators of the following institutions for their cooperation and hospitality when I visited their collections: The New York Botanical Garden (NY), Cornell University (CU, BH), SUNY, Syracuse (SYRF), Harvard University (GH, NEBC), Brooklyn Botanical Gardens (BKL) and the Buffalo Museum of Science (BUF). Label data from the above collections were entered on computer discs for later transfer to the master file of plant distribution at the New York State Museum (NYS). The classification system employed in this flora is that of Arthur Cronquist (1981). My thanks to him for continuing advice through personal communication.

IMPORTANT NOTE

All economic uses, folklore, medical and pharmaceutical notes, uses as foodstuffs, etc. are taken from the literature, and do not represent an endorsement by the author or the New York State Museum. Some of the uses may, indeed, be dangerous if incorrectly employed. Some are not effective and are presented for historical interest only.

LEGEND

FOR ALL MAPS IN THE FOLLOWING PUBLICATION THE FOLLOWING SYMBOLS APPLY

Solid dot—specimen seen by author: data on file at the State Herbarium (NYS)

Circle—field observation with location data and observer's name on file (NYS)

Hollow triangle—literature citation on file (NYS)

FOR ALL ILLUSTRATIONS IN THIS PUBLICATION, THE FOLLOWING LETTER-DESIGNATIONS APPLY:

- | | |
|---------------------|-----------------------|
| A. Habit sketch | G. Bark (trunk wedge) |
| B. Fruit | H. Seed |
| C. Infructescence | J. Silhouette |
| D. Fruiting calyx | K. Stamen(s) |
| E. Inflorescence(s) | L. Leaf (variant) |
| F. Flower(s) | N. petal (nectary) |

Platanaceae (Sycamore Family)

The Platanaceae: a tree family with members distributed widely in the Northern Hemisphere. The single genus, *Platanus*, comprises five to seven species. *Platanus occidentalis* L. is widespread in eastern North America, and two closely related taxa occur in the west. Fossils representing the genus are well-known from Cretaceous and Tertiary strata around the world. In modern times the sycamores are distributed mostly in areas north of the equator, ranging southward in North America to Guatemala, and in Asia to India and Laos. They are long-lived and often grow to become large, handsome trees. Several species are commonly planted as street and yard trees, of which the London plane-tree, *P. × hybrida* Brot., is perhaps the most popular.

FAMILY DESCRIPTION

Deciduous trees, some of which may live up to 500 years and reach a maximum height of about 65 meters. The distinctive bark exfoliates in broad, thin plates that leave patches of various shades of brown, tan, white and green. Bark of the mature limb-bases and trunk is darker, corky-ridged and furrowed. Trunks may form broad buttresses with age, sometimes attaining diameters of over five meters (d.b.h.). Twigs and young branches are terete with strongly sympodial branching. Lateral buds are divergent and resinous, each with a turbinate outer scale, enclosed by the petiole base, which leaves an encircling scar. Stipules are membranaceous, lobed, toothed and clasping at base, leaving scars that encircle the twigs. Leaves are simple, alternate, usually 3–9 palmately lobes, their margins often with large, irregular serrations. Petioles are dilated conically at base, enclosing lateral buds at the nodes. Plants are monoecious, bearing minute male and female flowers in separate, globose heads. Flowering heads are borne at the nodes on drooping peduncles or in racemes. Perianth parts are in series of 3–8 (9), often 4- or 5-merous. Male flowers have minute sepals and petals; 3–8 stamens alternate with the petals (and occasional staminodes or sterile carpels); the filaments with peltate, terminal appendages, exceeding and somewhat covering the anthers. Female flowers have 3–5 (8) minute sepals and petals, or petals may be absent. The gynoecium is of 5–8 (9) separate carpels, each bearing 1–2 ovules. The stigma is linear, marginal to the filiform style, which is expanded at its base to cap the ovary. The female inflorescence develops into a dense, globose, fruiting head, up to 4 cm broad, shattering late in the season. The fruit is an achene subtended by tawny bristles and covered with bristly hairs. The single seed is borne orthotropously, nearly or completely filling the single locule. The embryo is straight and endosperm is thin to fleshy and albuminous.

1. PLATANUS

Common Names: Sycamore, Plane-tree, Buttonwood

Authority: Linnaeus, Species Pl. I, p. 999, 1753

A genus of broad-leaved, deciduous trees native to North America, eastern Europe and Asia. The common sycamore or plane-tree is *P. occidentalis* L. The Arizona sycamore, *P. wrightii*, S. Wats., occurs in riparian areas of the American desert-southwest. Its close relative, *P. racemosa* Nutt., known as California sycamore, is distributed in the southern Sierra Nevada and Coast Ranges. So-called Mexican sycamore, *P. mexicana* Moric., is probably conspecific with *P. occidentalis*, differing from it primarily in having a white tomentum beneath the leaves. The wood of sycamores is tough, difficult to split and not of much commercial value except as a veneer. The trees are widely grown and serve as valuable shade producers.

1. *Platanus occidentalis* L.

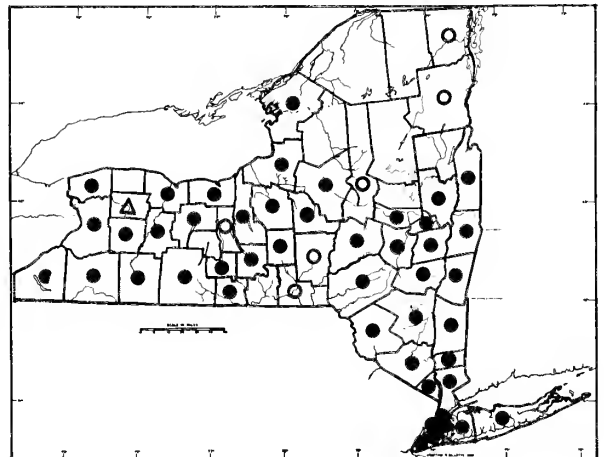
Common Names: Sycamore, American Plane-tree, Buttonwood, Water-beech, Buttonball-tree

Type Description: Linnaeus, Species Pl. I, p. 999, 1753

Synonym: *P. occidentalis* var. *glabrata* (Fern.) Sarg.

Origin: Cretaceous Forests (native to North America)

Habitats: Moist, rich soil of river bottoms, stream-courses and shores, occurring as scattered individuals or in small groves where shade-tolerant seedlings have become established



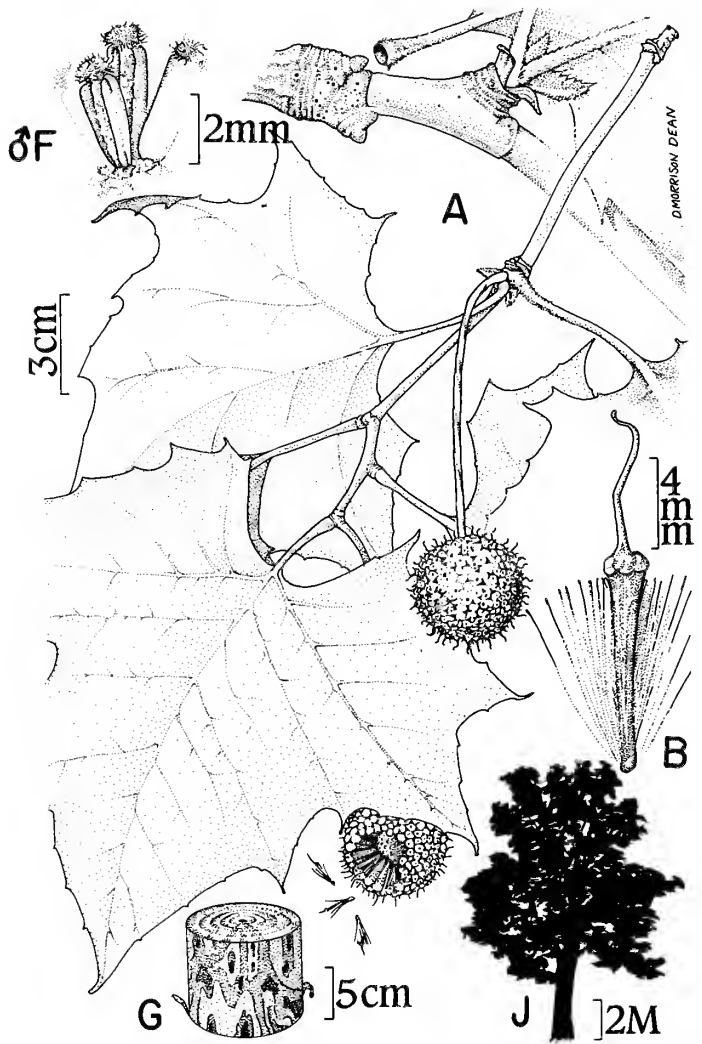
Habit: A broad-crowned, shallow-rooted, deciduous tree, capable of reaching grand proportions in both height and girth

Flowering: April–June

Fruiting: September–March

General Distribution: Southern Maine to Nebraska, south to north Florida and Texas with outliers in Mexico

Description: Plants **monoecious**; **female flowers:** **stigma** 1, linear, bright red when receptive; **style** 1 per ovary, filamentous, ca. 1.2 mm long in flower, up to 6 mm and recurved in fruit, its base expanded into a convex disc, capping the mature fruit; **ovaries** 3–7 (9) per flower, ca. 0.5 mm long; **fruit** an achene, 3–4 angled, compressed, linear-lanceolate (clavate by virtue of the style base), 7–8 (10) mm long, 1–2 mm broad, browning with age, subtended and surrounded by tawny, bristle-like hairs up to 8 mm long; **seed** 1, nearly or quite filling the single locule, orthotropous; **petals** minute, membranous, oval, 3–5, soon shattering; **sepals** minute, 3–5, coriaceous, coherent at base, puberulent adaxially, flowers sessile on a globose, fleshy **receptacle** up to 1.8 cm broad in fruit; **female inflorescence** a globose head, borne singly (rarely 2) at a node, 5–8 mm broad in flower, 2.5–3.3 (3.8) cm broad in fruit, greenish tan at first, persisting into winter, when they darken to brown and shatter; **peduncle** (of female head) villous at first, 1–2 cm long in flower, up to 5–10 (14) cm in fruit, becoming glabrous, pendulous, twisted, greenish-tan with brown lenticels; **male flowers:** **ovary** tissue vestigial (if present); **stamens** 3–6 (8), subsessile, ca. 2.5 mm long; **filaments** short, the **connective** expanded above the **anther** sacs to form a peltate, pubescent appendage; **staminodes** (when present) linear, projecting ca. 2 mm beyond the inflorescence at maturity; **petals** 3–8 (usually 4), minute, ovate, acute-tipped, membranaceous; **sepals** 3–8 (usually 4), connate at base, minute, ovate, acute with puberulent adaxial surfaces; flowers sessile on a globose, fleshy **receptacle** 3–7 mm broad; **male inflorescence** a globose head, 0.8–1.2 cm broad at anthesis; **peduncle** (male head) villous, 1.3–2.5 (3.5) cm long, early deciduous; **leaves** broadly ovate to reniform, the blade shallowly to deeply 3–7 lobed with an acute to cuspidate tip, usually with a number of large, sharp serrations along the margins, base truncate to cuneate, upper surface moderately stellate-pubescent with some pilose and dendroid hairs along the veins, becoming glabrescent with age, lower surfaces densely white to tawny pubescent when young, with stellate and complex dendroid hairs persisting along the prominent veins as the surface sheds most pubescence with age, mature blades 5–20 (28) cm long, 6–25 (32) cm broad; **fall color** pale to dark yellow, often spotted with brown; **petioles** 2–12 (14) cm long, stellate-pubescent, expanded at base to form a cap over the resinous **lateral buds**, the cap-like outer **bud scale** up to 5 mm long, often persistent after sprouting, scars encircling the buds (**terminal buds** lacking); **stipules** membranaceous, somewhat pellucid, clasping the stem, 2–11 mm long and broad, oval or 3–5 lobed, cuspidate, pilose abaxially when young; **branches** somewhat dimorphic, the fertile, lateral short-shoots with very short internodes, shoots of the main axis terete, tan to orange-brown with pale greenish exfoliating **bark**; bark of the upper trunk and branches exfoliating in plates (up to 50 cm broad on lower branches), leaving a mosaic pattern, the peeled surface green at first turning various shades of ash-white to tawny yellow and brown; bark of lower branches and trunk is corky, furrowed and dark red-brown; **crown** spreading broadly, oval and relatively open with age; **trunk** often forming **buttresses** and hollow with age, becoming massive, up to 5 meters (d.b.h.) and 65 meters tall, from a shallow, spreading **root system**. (2n = 42)



Intraspecific Variation and Hybridization: Leaf shape is particularly variable between sycamores, and individual trees often show considerable heterophylly. Leaf sinuses may vary from deep to extremely shallow, and margins may be profusely serrate or nearly entire. The number of fruiting heads is usually one per node in *P. occidentalis* L., but rarely there may be two. Specimens showing this condition have been misidentified as London plane-tree, *P. × hybrida* Brot. [*P. × acerifolia* (Ait.) Willd.], which usually bears 2–3 heads per short-shoot. Although it is often cited as a hybrid (*P. occidentalis* × *orientalis*), the London plane-tree probably did not arise in the wild, since its parents are from different continents. Although details remain obscure, Henry and Flood (1919) presented a case for the horticultural origin of this hybrid in Great Britain about 1670. Biological evidence does not conflict with the premise; chromosome numbers of the taxa involved are the same, and pollen of *P. × hybrida* is about 90% fertile (Sax, 1933b).

Importance: *Platanus occidentalis* is often planted as a street tree, but the London plane-tree is far more commonly cultivated. The seeds are of little value to wildlife, but they are eaten by some songbirds such as finches. Sycamore wood was once highly valued for panels and furniture building, but it is now used mainly as a veneer, bracing and in crate and box construction. Being extremely hard to split, it makes excellent butcher blocks. Radial cuts of the wood often exhibit attractive patterns, prompting its use in both decorative furniture and musical instruments. Early settlers put it to many uses, including the building of large dugout canoes in which they hauled furs and even livestock. *Platanus* species are documented allelopaths, retarding, and, in some cases, prohibiting the growth of other plants in their vicinity. Sycamore pollen is released in great volumes in the spring, and it is listed as a major cause of hay fever (an aeroallergen).

Hamamelidaceae (Witch Hazel Family)

The Hamamelidaceae: a family of trees and shrubs comprising some 26 genera, about half of which are monotypic and probably relictual from Cretaceous times. Of the 90–100 species in the family, most are found in subtropical Asia, including the largest genus, *Corylopsis*, with about 25 species. This family is represented in the eastern, deciduous forests of North America by *Hamamelis*, *Liquidambar* and *Fothergilla*, of which the first two genera also have eastern Asiatic species. Various members of the Hamamelidaceae have medical, horticultural or silvicultural importance.

FAMILY DESCRIPTION

Deciduous or evergreen trees and shrubs with simple, alternate (rarely opposite) leaves. Branching is often sympodial with obvious short-shoots present in some genera. Leaves and stems are frequently covered with stellate hairs. Leaves may be unlobed, but they are more commonly palmately divided. Petioles subtend scaly or naked buds. Stipules are nearly always present and deciduous. Plants are monoecious or with bisexual flowers. Inflorescences are spikes or capitate heads (rarely racemes or panicles) sometimes subtended by foliaceous bracts. Flowers often with reduced perianths, 4- or 5-merous (7), perigynous (or perianth absent); calyx often persistent, frequently basally fused, adhering to the fruit; petals commonly 4 or 5, unfused, narrow to much-reduced. Stamens 4–5 (10), alternating with the petals; anthers opening by valves or longitudinal slits; staminodes may be present, equal in number to stamens or up to 30 + per flower. Ovaries are 2 (3), ventrally fused, but with free styles. Ovules (1) 2 to several per ovary, each within a single locule, usually with axile placentation. Fruit a capsule, partially inferior with a leathery to woody exocarp and bony endocarp; dehiscence is septicidal or loculicidal. Seeds are hard and lustrous and may be winged; their oily, proteinaceous endosperm encloses a large, straight embryo.

KEY TO GENERA

1. Leaves palmately veined and deeply lobed, roughly star-shaped; female flowers (and fruits) borne in peduncled, globose heads; petals absent 1. *Liquidambar*
1. Leaves strongly pinnately veined, with wavy or toothed margins, not deeply cut; female flowers (and fruits) borne in subsessile, axillary clusters; petals yellow, long, strap-like, often twisted 2. *Hamamelis*

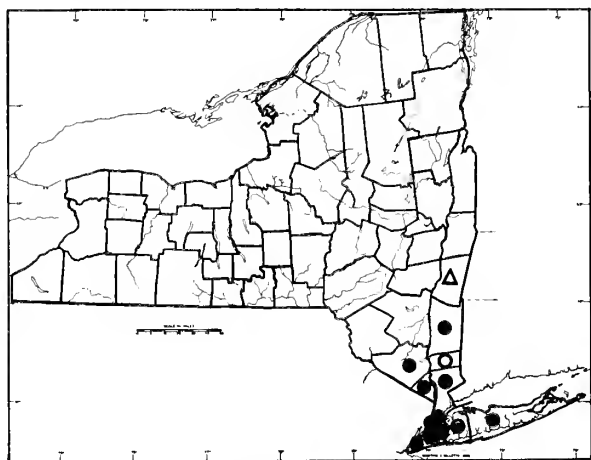
1. LIQUIDAMBAR

Common Names: Sweet Gum, Red Gum, Bilsted

Authority: Linnaeus, Species Pl. I, p. 999, 1753

A genus of three arborescent species with one broad-ranging tree in North America and two closely related species in Asia. The well-known sweet gum tree of the deciduous forests of North and Central America is *L. styraciflua* L. This

species differs from its Asiatic counterparts, *L. orientalis* Mill. and *L. formosana* Hance, mainly in the lobing of its leaves. Storax or copalm, a substance derived from these trees, is of commercial value, due to its pleasant odor and texture. *Liquidambar* species are very desirable horticulturally, and their woods have a number of uses.



1. *Liquidambar styraciflua* L.

Common Names: Sweet Gum, Red Gum, Bilsted, Storax-tree, Star-leaf Gum, Alligator-tree, 'Possum-tree, White Gum, Copalm

Type Description: Linnaeus, Species Pl. I, p. 999, 1753

Synonyms: *L. macrophylla* Oerst., *L. styraciflua* var. *mexicana* Oerst.

Origin: Cretaceous Forest (native North American)

Habitats: Lowlands, moist woods, swampforests, riverbanks and shores to dry sites such as old fields and natural clearings

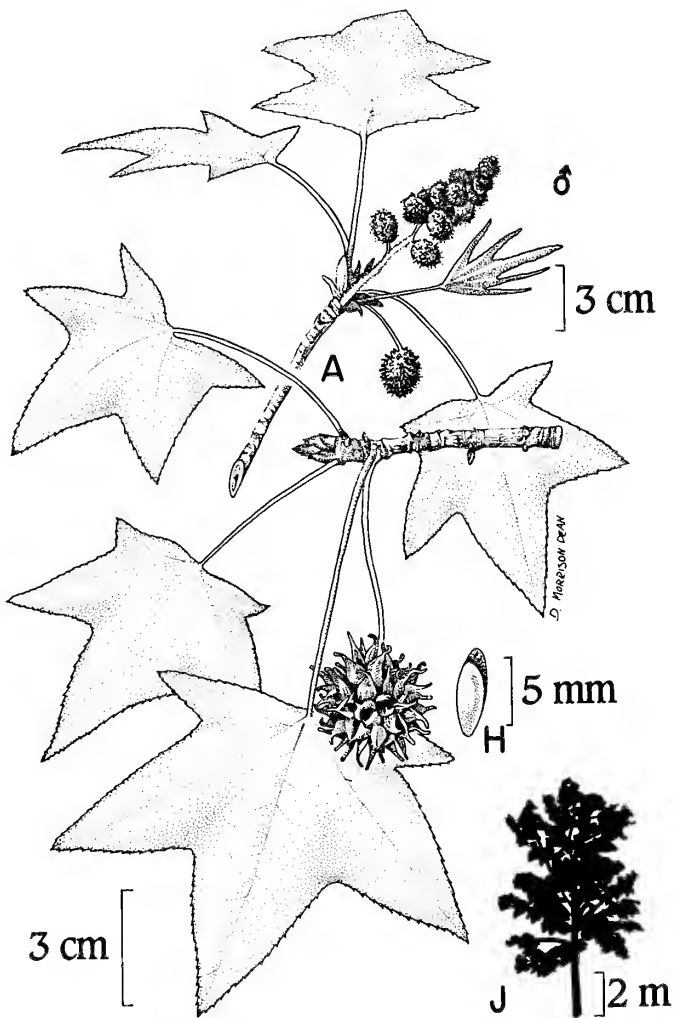
Habit: A tall, deciduous tree with an oval to pyramidal crown and straight trunk, buttressed with age

Flowering: May–June

Fruiting: September–March (May)

General Distribution: Connecticut to southern Illinois (excluding the Appalachians) to eastern Texas and northern peninsular Florida with outliers at higher altitudes from Mexico south to Honduras

Description: Plants **monoecious**; **female flowers:** stigma 1, elongate, marginal along the upper 5–6 mm of the style which is ca. 2 mm long in flower, becoming a tough, glossy beak 5–8 mm long in fruit; **ovary** 1, consisting of two fused carpels, partially inferior with a perigynous disc; **fruit** a woody, glossy, 2-beaked capsule, fused to some degree with surrounding capsules in the head, septically dehiscent, with valves 2–3 mm broad; **ovules** several per carpel in rows within the single locule, only the basal 2 usually fertile; **seeds** (1) 2 per carpel, shiny brown, cylindric, 5–7 mm long with a membranaceous, terminal wing ca. 2 mm long; **staminodes** usually 4 per flower on the disc of the **receptacle**; **perianth** absent or reduced to scales; **female inflorescence** dense, spherical, ca. 1 cm broad in flower; **fruiting heads** woody, globose, 2.3–3.6 cm broad (including beaks), borne singly (or 2–3 per node) on pendulous **peduncles** 5–9 cm long; **male flowers** much-reduced; **stamens** 2–3 mm long, borne in clusters of indefinite numbers on a spheroid **receptacle**, the only evidence of individual flowers being rare, vestigial **pedicels** or **perianth scales**; **staminate heads** globose, 5–8 mm broad, borne in terminal racemes, 3–10 cm long, each of about 15 heads, those near the tip of the compound **male inflorescence**



(raceme) nearly sessile, the lower ones on villous **peduncles** up to 3 cm long; **bracts** subtending the flower heads oval, deciduous, densely villous, ca. 5 mm long, 3 mm wide; **bracts** at the raceme base linear-lanceolate, less villous or glabrous with villous tufts at their tips; **leaves** simple, orbicular in outline, star-like with 5 (7) pointed lobes, 8-18 cm long and broad, the lobe tips obtuse to acuminate, leaf base truncate or slightly cordate, margins serrate (to dentate), venation palmate with one strong vein per lobe, surfaces bright green, mostly glabrous at maturity, villous along the veins of the lower surface, upper surface, waxy, lustrous; **fall color** dark red to deep maroon-purple with an occasional bright red or yellow leaf; **petioles** slender, terete or grooved, mostly glabrous, 3-11 (14) cm long; **terminal buds** 6-9 mm long, imbricate with tough, glossy, red-brown scales; **lateral buds** similar but smaller with fewer scales; **twigs** slender to stout with pronounced, oval lenticels and prominent bud-scale scars; young **branches** angled to terete, the **pith** homogeneous, stellate; **bark** at first smooth, becoming corky with excrescences that may protrude up to 4 cm from young branches and trunks, mature **bark** deep-furrowed, with elongate, rounded, flaky, ridges, grayish-brown to nearly black in older trees; **crown** oblong to pyramidal; **trunk** usually straight, **buttressed** with age, up to 1.5 m broad (d.b.h.) and 35 (42) m tall, from a spreading **root system**. (2n = 30, 32)

Importance: Sweet gum is widely grown as an ornamental tree, hardy as far north as central New York and New England. Its unusual fall coloring and corky bark add to its novelty as a street or yard tree. The generic name apparently refers to a balsamic, resinous fluid that exudes at trunk wounds. The pleasantly scented extract has been used in perfumes and as a flavor in medicines and chewing gums. The substance has been called liquid storax or "styrax", but it should not be confused with extracts from members of the Styracaceae. The 19th century name of copal-balsam or copalm is also confusing, since it was also applied to a variety of organic and inorganic substances. The wood of *Liquidambar* was available to early colonial furniture builders of the lower Hudson Valley of New York. It is sometimes called "satin walnut" in the furniture trade; it is less popular now than in the 18th and 19th centuries, being used primarily in decorative furniture or as a veneer for wall paneling.

2. HAMAMELIS

Common Name: Witch Hazel

Authority: Linnaeus, Species Pl. I, p. 124, 1753

A genus of 5 (or fewer) species, distributed in eastern North America and temperate Asia. Widespread, northeastern American, *H. virginiana* L. usually blooms in late fall or early winter. The very similar, spring-blooming *H. vernalis* Sarg. occurs southward, but overlaps *H. virginiana* in range, and may be conspecific with it (see later discussion). Members of the genus *Hamamelis* are of minor horticultural importance. Extract of witch hazel bark has long been used as a liniment and tonic.

1. *Hamamelis virginiana* L.

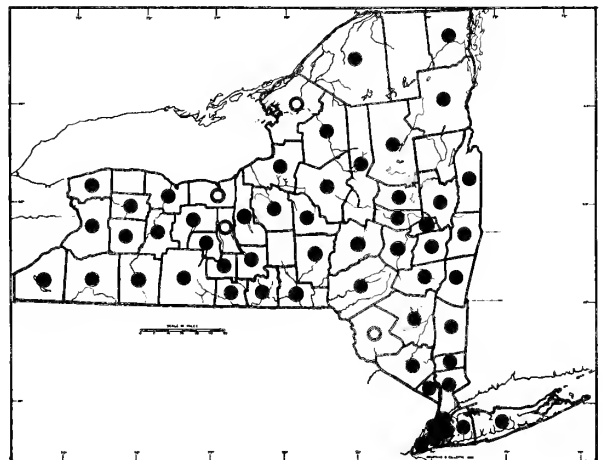
Common Names: Witch Hazel, Spotted Alder, Snapping Hazel, Devil's-tobacco, Tobacco-wood, Pistachio, Winterbloom

Type Description: Linnaeus, Species Pl. I, p. 124, 1753

Synonyms: *H. macrophylla* Pursh, *H. virginiana* var. *macrophylla* (Pursh) Nutt., *H. virginiana* var. *parvifolia* Nutt.

Origin: Arctotertiary Forest (native to North America)

Habitats: Moist woods, thickets and bottoms to drier hill-sides



Habit: A shrub or small tree, sometimes forming thickets

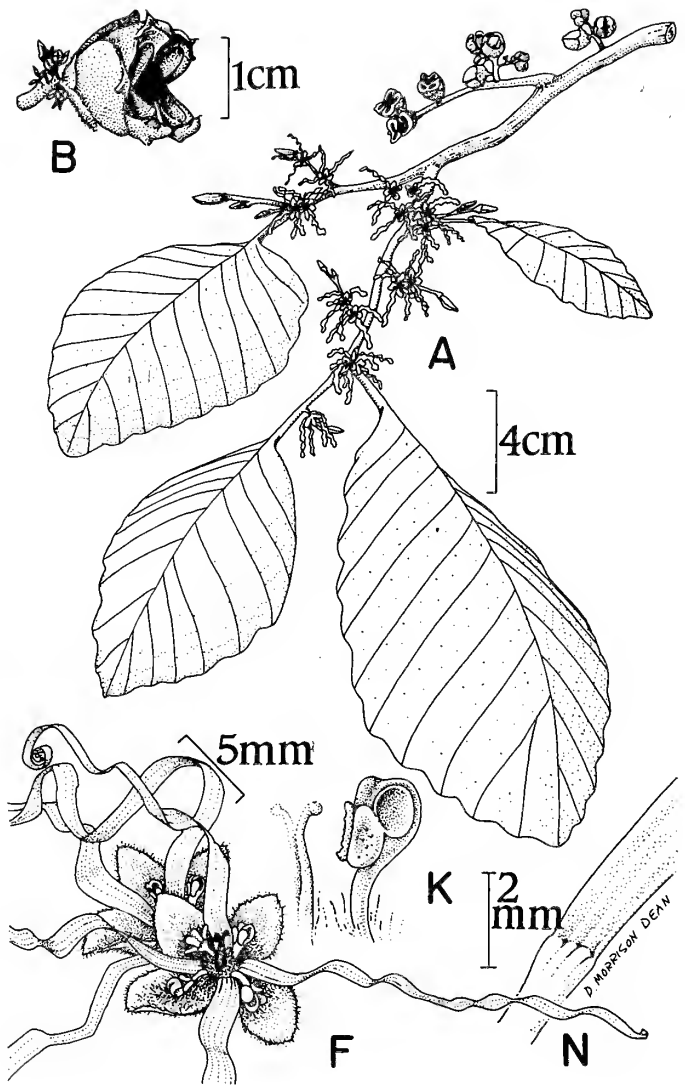
Flowering: Late September–December (February–March)

Fruiting: Maturing in August, persisting through the year

General Distribution: New Brunswick to western Minnesota, south to eastern Oklahoma and Texas, with outliers in west Texas and Mexico

Description: Plants with **bisexual** flowers (or polygamous); **stigma** 1 per style, indistinct; **styles** 2, linear, proximally divergent from the ovary tip, ca. 1 mm long, becoming short **beaks** in fruit; **ovary** of 2 fused, unilocular carpels, each with 1–2 pendulous **ovules**, the ovary base slightly imbedded in the **receptacle**, partially inferior to a perigynous disc; **fruit** a woody capsule, elliptic-ovoid, 1.3–1.7 cm long, 0.8–1.5 cm wide, short stellate-pubescent, dehiscing at summit by 4 (3) **valves**, the endocarp bursting explosively, dispersing seeds up to 12 meters; **seeds** usually 1 per locule, 8–9 mm long, 4–5 mm wide, ellipsoid, the coat shiny with brown and tan markings; **embryo** straight with a fleshy **endosperm**; **stamens** 4, alternating with the petals, ca. 2 mm long; **filaments** with a fleshy connective; **anthers** introrse, dehiscing by valves; **staminodes** scale-like, opposite the petals; **perianth** of two series; **petals** 4 (5), strap-like, long-linear (8) 12–21 mm long, 1–3 mm wide, with abruptly obtuse tips, yellow, creamy (or reddish- to bronze-tinged); **nectaries** present at petal bases; **calyx lobes** 4, 1.0–1.6 mm long and broad, tough, glossy, brownish-yellow within, stellate-pubescent adaxially, their obtuse tips tufted with villous hairs, (lobes) united below into a perigynous **hypanthial cup** that encloses the lower capsule (up to 1 cm deep and 1.4 cm wide); **floral bracts** 2–3, enclosing the base of the flower in bud, ca. 1.5 mm long and 1 mm wide, usually persistent in fruit, with copious stellate pubescence; **inflorescences** axillary or terminal on short-shoots, often appearing as capitate clusters of 3 flowers each (1–5); **peduncles** absent or a very short, branched, **common axis** present, woody, 1–4 mm long, joining the flower cluster to a node or short-shoot; **leaves** oval to broadly obovate or suborbicular, simple, 5–15 (26) cm long, 3–11 (16) cm broad, tips acute to obtuse, bases rounded to obliquely subcordate (rarely acute), blade with a strong midrib and a number of strong, parallel veins pinnately diverging from it to terminate in rounded lobes (or teeth) at the margin, the teeth serrate-apiculate to broadly dentate with rounded tips, producing an undulating marginal outline (rarely subentire), mature leaf surfaces glabrescent to stellate-pubescent or white villous, especially below; **fall color** pale to dark yellow or brown; **petioles** mostly stout and short, 3–12 (28) mm long, pubescent; **stipules** small, deciduous; **twigs** covered with villous and stellate pubescence, which soon sheds, exposing smooth, gray-brown **bark** of young stems; bark of lower limbs and trunks brown, smooth becoming scaly with age, revealing dark purple inner bark upon shedding; only very old bark ridged; **trunks** usually short, **crowns** broad, plants shrubby or rarely trees up to 8 (15) m tall and 40 cm (d.b.h.) from spreading (but not suckering) **root systems**. ($2n = 24$)

Infraspecific Variation: The leaves of North American witch hazels are widely variable in shape, size, lobing and pubescence. Petal length and color are also variable, particularly in some extreme Ozarkian populations. In these, flowering occurs primarily in February, and fruits are set earlier than in their northern counterparts. Reddish-tinged, shorter petals in some of the southern populations have prompted the recognition of a second American species, *H. vernalis* Sarg. Most of the variation in the complex is included in this segregate species, as was discussed by E. Anderson (1933, 1934). Even in northeastern states, *H. virginiana* can flower from the bases of short-shoots during a February or March thaw, thus the argument for phenological separation and lack of hybridization between these taxa is weak. The group deserves further study.



Importance: Witch hazel derives its common name from its use by diviners (dowsers) as a forked stick, to aid in the search for water and precious metals. The ancient practice came to America from Europe, where wych elm, *Ulmus glabra* Huds., was used for the purpose. Holding the tips of a Y-shaped cutting from a young branch, the seeker walks with the axis held laterally until it points down “voluntarily”, indicating an underground substance (or perhaps a magnetic anomaly). The Stockbridge, Mohawk and Potawatomi Indians extracted witch hazel bark for treatment of sore muscles and eyes, and the liquid was drunk as a tea. Early European settlers learned these uses and put them to practice, in addition to which they drank a witch hazel decoction for a number of ailments, including hemorrhoids and various types of internal bleeding. By the early 20th century, witch hazel was officially listed in the Pharmacopeia; its values were said to be astringent and hemostatic. Witch hazel extract does have astringent properties, due to its high tannin content, and over a million gallons a year are sold. Modern medical practice, however, treats it as little more than a soothing placebo. The winter flowers and explosively discharged seeds of witch hazel make it a conversation piece and an interesting plant to cultivate.

Ulmaceae (Elm Family)

The Ulmaceae: a family of woody plants with wide distribution from the Northern Hemisphere south to the tropics, comprising about 18 genera and 150 species. Well-known North American natives are *Ulmus*, *Celtis* and *Planera*. There are five or six native elms (*Ulmus*) in the United States, all of which are distributed east of the Rocky Mountains. Some elms make excellent street plantings. *Ulmus americana* L. was a much-favored shade tree until it was struck by Dutch elm disease, and, although it has been largely replaced in cultivation by Eurasian species and hybrids, it may come back to prominence in the future, through the distribution of a recently developed disease-resistant strain. The wood of elms is important commercially. *Celtis* is a genus of some 50 species (the hackberries and their relatives) with about seven species native to North America. The hackberries are grown ornamentally, and they also produce fruits which are a source of food for wildlife. The genus *Planera* is represented by *P. aquatica* Gmel., a tree of southeastern swampforests. *Trema*, a primarily tropical genus, extends northward to south Florida. *Zelkova serrata* (Thunb.) Mak., an Asian species, is grown as an ornamental tree in northeastern North America, and the wood of *Zelkova carpinifolia* (Pall.) Koch is used in the cabinet trade, where it is known as false sandlewood.

FAMILY DESCRIPTION

Mostly deciduous trees and shrubs with sympodial branching and alternate to sub-opposite, often distichous leaves. Leaf blades are simple and frequently oblique at the base. Petioles are subtended by early-deciduous, paired stipules. Plants are polygamo-monoecious, or have predominantly bisexual flowers (as in *Ulmus*). Flowers are borne in axillary cymes or fascicles (or singly) from branchlets of the current or past season. They are radially symmetrical, with a single perianth whorl, usually of 4–9 lobes (sepals), often fused below into a persistent, campanulate cup. The stamens are borne opposite the sepals, and are usually of the same number; anther sacs are 2-celled, dehiscing longitudinally, borne on distinct filaments. The single ovary is superior; the 2 fused carpels each have a single locule (sometimes 2 locules in *Ulmus*), bearing one pendulous (anatropous) ovule. Styles are 2 (1), filamentous and free, with receptive stigmatic areas on the upper, inner margins. Fruits are either single-seeded, winged samaras or fleshy drupes. Endosperm is scanty or lacking.

KEY TO GENERA

- 1. Fruit flattened, winged (a samara), greenish to yellow-brown; leaves usually doubly serrate with lateral veins running parallel toward the margins1. *Ulmus*
- 1. Fruit an ovoid, fleshy drupe, blue, black or orange; leaves singly serrate or entire, the larger lateral veins often arching from near the leaf base2. *Celtis*

1. ULMUS

Common Name: Elm

Authority: Linnaeus, Species Pl. I, p. 225, 1753

A genus of about 25 species of trees and shrubs, widely distributed in the Northern Hemisphere. Elms are important components of many temperate and sub-tropical forest associations in eastern North America, northern Africa and across Eurasia. They are minor timber producers, and the bark of some species has been used for fiber, food and medicine. The

wood has been used for secondary reinforcement in furniture and cabinets and as the primary wood in Danish Modern furniture. Many elm species are highly prized as shade trees, and they are used frequently to line city streets.

Description: Plants with **bisexual** flowers (rarely polygamous); **stigmas** linear, papillate, borne along the upper abaxial margins of the 2 styles; **styles** 2, slender, divergent (or considered a single 2-cleft style), their tips incurved around a terminal cleft in the fruit wing; **ovary** superior, sessile or stipitate, unilocular (rarely 2) with a single anatropous **ovule**; **fruit** a more or less flattened samara with a membranaceous wing; **seed** 1, compressed-ovate with a raphe or wing; **embryo** straight; **endosperm** lacking; **stamens** 3–9, borne from near the base of the perianth cup (disc), often equal in number to sepals; **filaments** linear, **anther** sacs globose, exserted from the mature flower; **perianth** a single series with 4–9 lobes (**sepals**), united into a funnellform, campanulate to funnellform disc or cup which is persistent in fruit; flowers borne on 2-bracteate **pedicels**; **inflorescences** axillary, racemes or clusters; **leaves** simple, distichous, deciduous or semi-evergreen, often inequilateral, pinnately veined with doubly (singly) serrate margins; **petioles** with deciduous **stipules**; axillary leaf **buds** with closely imbricated scales; **stems** branching distichously, **branches** of some species with corky wings; **bark** often ridged and deeply furrowed; trees (or shrubs) with shallow **root** systems and/or **taproots**.

KEY TO SPECIES OF ULMUS

1. Flowers subsessile, not pendulous; fruits short-pedicelled, not pubescent along their margins (3)
1. Flowers strongly pedicelled, pendulous; fruits pubescent along their margins (2)
 2. Inflorescence of fascicles, lacking a central axis; branches without corky wings; samaras less than 1.3 cm long at maturity. 1. *U. americana*
 2. Inflorescence a panicle with a strong central axis; young branches often with corky wings or ridges; samaras 1.4–2.3 cm long at maturity 2. *U. thomasi*
3. Leaf margins predominantly singly serrate; leaves sub-equal at base, narrowly elliptic; young branches slender, sometimes drooping; shrubs (or small trees) 3. *U. pumila*
3. Leaf margins strongly doubly serrate; leaves often inequilateral, obtuse at base; young branches relatively thick (corky in some); becoming trees (4)
 4. Samara muricate-puberulous to pubescent in the area over the seed; stamens 5–9; hairs of the winter buds rusty brown 4. *U. rubra*
 4. Samara glabrous; the surface area over the seed may be wrinkled, but not muricate or pubescent; stamens 3–5; hairs of the winter buds not red-brown. (5)
5. The large, basal leaf-lobe concealing or strongly overlapping the petiole; samara ca. 1.5 times longer than broad; seed near its center; branches not corky 5. *U. glabra*
5. The large, basal leaf-lobe not strongly overlapping the petiole; samara about as long as broad, the seed displaced toward its apex; branches corky 6. *U. procera*

1. *Ulmus americana* L.

Common Names: American Elm, White Elm

Type Description: Linnaeus, Species Pl. I, p. 226, 1753

Synonym: *U. alba* Raf.

Origin: Arctotertiary Forest (native to North America)

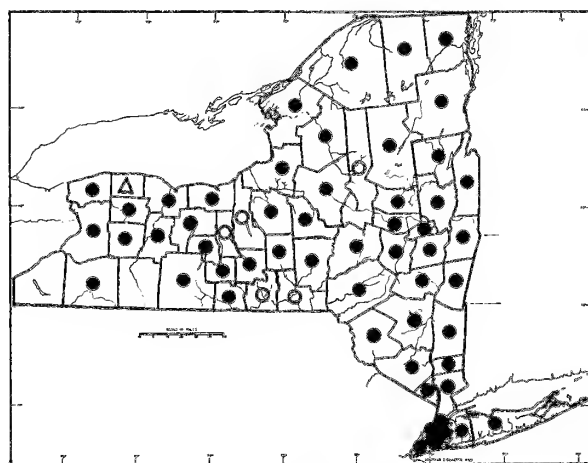
Habitats: Moist woodlands and riverbanks to drier slopes on rich, often limy, soils (also cultivated)

Habit: A tree with a broadly oval to vase-shaped crown

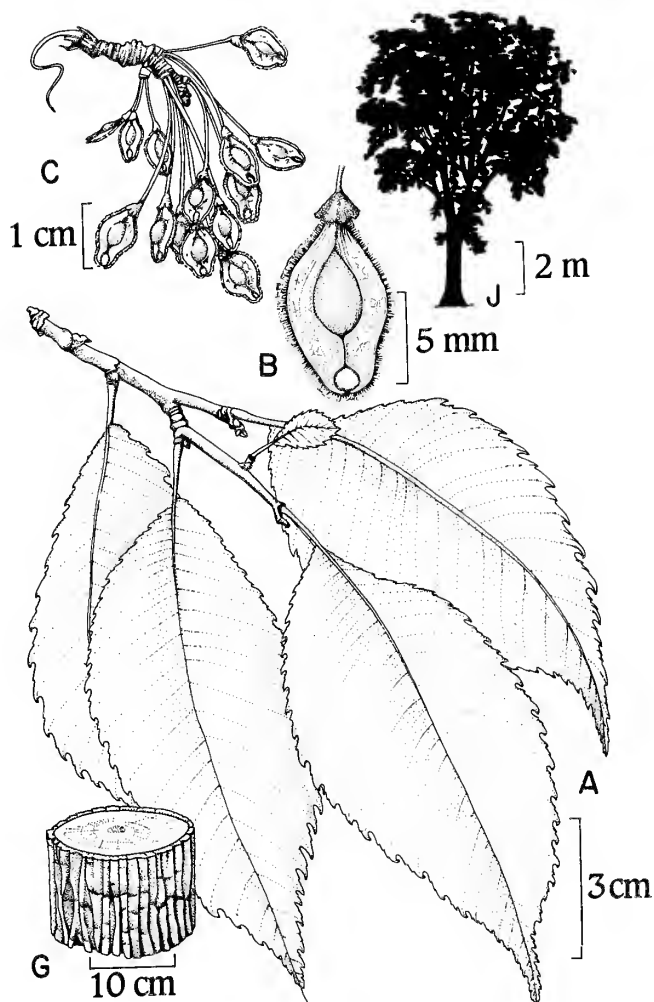
Flowering: Late March–April

Fruiting: May (June)

General Distribution: New Brunswick to Saskatchewan south to central Texas and Florida

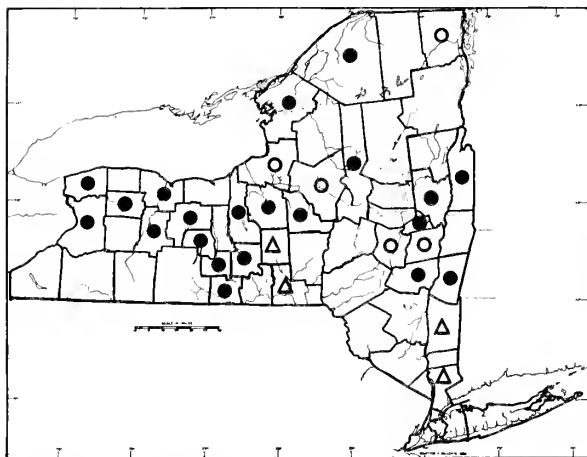


Description: Plants with bisexual flowers (or polygamo-monoecious); stigmas papillate, linear along the upper ad-axial surfaces of the 2 slender, divergent styles; styles persistent in fruit, incurved, ciliate adaxially; ovary compressed, ca. 2 mm long, 1.5 mm broad, ovate with ciliate margins; **fruit** a samara, 0.8–1.2 cm long, 0.7–1.0 cm broad at maturity, elliptic, the wing constricted into an oval cleft between the incurved styles which often touch at the tips, both wing and seed surfaces glabrous, but the wing margin densely covered with villous hairs up to 1 mm long (“ciliate”), surface brown over the seed, the wing greenish-tan, strongly reticulate-veiny, margin tawny, its villous hairs paler; **seed** ca. 3.5 mm long, 2 mm wide, ovate, obtusely pointed at one end; **stamens** (6) 7–8 (9), exserted from the perianth, 2.1–4.6 mm long, well-differentiated into slender filaments and globose anthers; **perianth** of a single series, the turbinate to campanulate tube attenuated at base, lobes (sepals) 5–9, with rounded tips, shallow sinuses and ciliate margins, 2.5–3.0 mm long and broad; **pedicels** slender, jointed, glabrous, mostly 0.6–1.1 cm long; **inflorescence** compound, of small fascicles of 3–4 flowers, each subtended by small, leathery, lanceolate bracts with pubescent margins, (each inflorescence) subtended by a lorate scale 3–4 mm long, 1–2 mm broad with ciliate margins; **inflorescence bud** ovate with imbricate red-brown scales, strigulose; **leaves** 4–10 (16) cm long, 2–7 (9) cm wide, elliptic to obovate, inequilateral with acute to acuminate (rarely obtuse) tips and oblique bases, margins with coarse, double serrations (larger serrations falcate), upper surface glabrous to scabrescent, lower surface pilose to scabrous (or glabrescent); **fall color** pale to dark yellow; **petioles** pilose to scabrous, 3–12 mm long; **stipules** deciduous, linear-lanceolate, 9–18 mm long, clasping at base; **lateral buds** ca. 2 mm long, ovoid with acute tips; young **twigs** glabrous to densely pilose (or scabrous) with red-brown to grayish bark, exfoliating, but not strongly corky unless injured; **mature bark** gray with scaling, flat-topped ridges (with reddish and pale banding when peeled transversely), the fissures linear to diamond-shaped; **trunk** buttressed with age, up to 3.6 meters (d.b.h.), 45 m tall, often forking 3–4 m above the base into large, ascending branches, to form the vase-shaped **crown**; **root system** spreading or with a taproot in dry climates. ($2n = 28, 56$)



Intraspecific Variation and Hybridization: Fernald (1950) recognized taxonomic forms based on shoot pubescence; however, young stem and leaf surfaces may be glabrous or variably pilose to scabrous, even on the same plant. *Ulmus americana* has not been known to hybridize freely in nature, partially because most of the surviving native population is tetraploid, while most other species of the genus are diploid. However, extensive hybridization experiments have been carried out between diploid American elm and its closer European relatives, such as *U. laevis* Pallas. These genetic programs were initiated in an attempt to find plants resistant to Dutch elm disease and phloem necrosis. Successes have been achieved, followed by the distribution of seedlings of disease-resistant strains. These are being planted in the wild in some places, as well as along streets and in yards. Such genetically altered plants may begin to replace the native tetraploids in the future, further broadening the range of variability within the taxon known as *U. americana*.

Importance: Once the most important street tree in North America, American elm has now largely been replaced, due to great losses to Dutch elm disease. The fruits are eaten by a number of wild birds and mammals, and the bark has been used as emergency food by deer and humans. An extract of the bark has been used in lotions and dyes, and fibrous bark strips were once used in caning chairs and weaving crude rope. The tough, heavily crossgrained wood is hard to split, and it wears well under abrasion. It has been used for utensils, mortars and pestles, wheel spokes, flooring, crate and barrel making and a number of other functions where durability was desirable. Due to its resistance to decay, even when in contact with water or moist soil, white elm was used for pilings, railroad ties, bee hives and water tanks. Furniture reinforced with elm wood and cabinets made from elm were also once relatively common.



2. *Ulmus thomasi* Sarg.

Common Names: Rock Elm, Cork Elm, Winged Elm

Type Description: Sargent, Silva, 14: 102, 1902

Synonym: *U. racemosa* Thomas, not Borkh.

Origin: Eastern North America

Habitats: Often associated with limestone, occurring from rich swampforests in mucky soils to open, calcareous flatrock

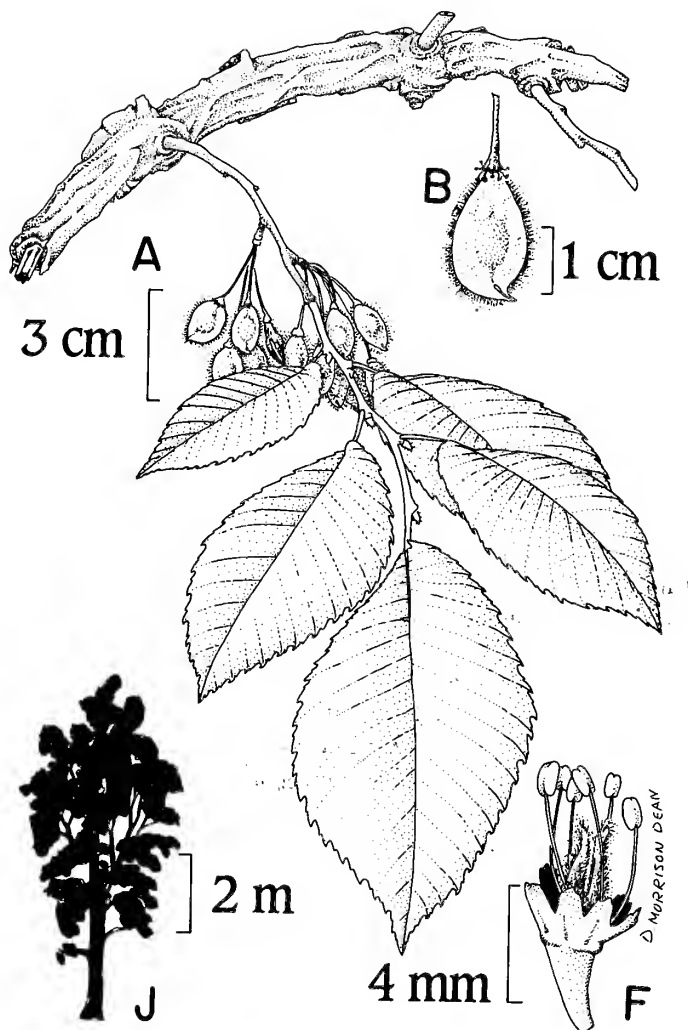
Habit: A tree, usually with a straight trunk and oblong to oval crown

Flowering: April–May

Fruiting: June–July

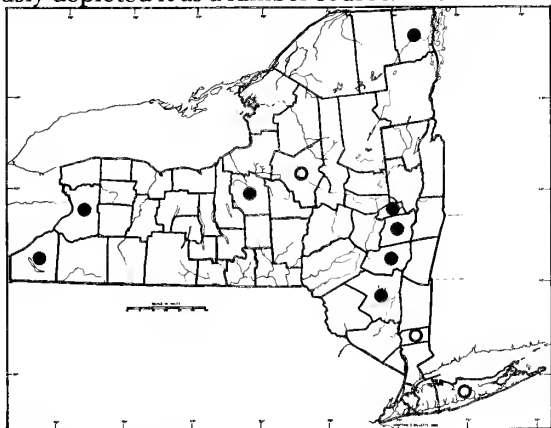
General Distribution: Primarily around the Great Lakes with outliers from southern Quebec and New Hampshire to northern Minnesota, west to Nebraska, south to a sub-center of distribution in Tennessee

Description: Plants with **bisexual** flowers (or polygamo-monoecious); **stigmas** papillate, linear, on the abaxial tips of the styles; **styles** 2, slender, divergent, ca. 1 mm long, persistent in fruit; **ovary** 1, compressed, 1–2 mm long, villous; **fruit** a samara, ovate to elliptic, 1.4–2.3 cm long, 0.9–1.7 cm wide, obtuse to acute at the tip, the persistent, incurved styles densely villous, separated by a cleft ca. 1 mm in diameter, fruit base obtuse to cuneate, often asymmetric, a single, large vein on each side arching from near the **wing** to the styles, surfaces greenish to yellow-brown, densely villous overall, especially along the conspicuous rim (“ciliate”); **seed** turbinate in outline, truncated at each end, ca. 7 mm long, 4 mm wide, the surface dull brown; **stamens** 5–8, **filaments** 4–5 mm long, **anther sacs** globose, ca. 1 mm broad, exerted from the perianth; **perianth** of a single series, purplish-green, the tube funnellform to campanulate, 3–5 mm long, margin with 6–9 rounded lobes (**sepals**) ca. 1 mm long and broad, sparsely ciliate at margins, surface glabrous or puberulent at tube base; **pedicels** jointed at the strongly attenuated flower bases, glabrous or puberulent at base, slender, from 2–12 mm long, in the same inflorescence; **inflorescence** a raceme-like panicle up to 5 cm long, the **main axis** a reduced, sympodially branching fertile shoot, bearing small fascicles of flowers (often in the axils of **dwarf leaves** or **bracts** up to 5 mm long, 2 mm wide), the axes green, villous and slender; smaller **inflorescence bracts** scarious, villous mostly on margins, obovate to spatulate, 1–2 mm long; **inflorescence bud** red-brown, 6–11 mm long, with leathery, imbricated scales, the bud tip sharp; **leaves** 6–11 (15) cm long, 4–7 (9) cm broad, elliptic to ovate or obovate, only slightly inequilateral to subequal bases and acuminate (acute) tips, margins coarsely doubly serrate, upper surface glabrous at maturity with a few hairs on the main veins, lower surface paler green, puberulous to velutinous, especially along veins; **fall color** yellow; **petioles** 2–10 mm long, mostly glabrous; **stipules** pale, early deciduous, membranaceous, lorate, often obspatulate, 7–11 mm long, 1–3 mm broad, leaving scars partially surrounding the twigs; **lateral buds** small, oval with few pubescent, imbricated scales; **twigs** densely villous to woolly, becoming glabrous, reddish to graybrown; **bark** soon developing **corky wings** and ridges (often shed later as limbs expand); **mature bark** gray to black with scaling, flat-topped ridges and deep, linear to diamond-shaped fissures; **trunk** up to 27 meters tall, 1.8 m (d.b.h.), with an oval **crown**; **root system** shallow and spreading or with a taproot. (2n = 28)



Intraspecific Variation: Plants vary in the number of corky and winged stems present (rarely absent), especially as the tree ages. The unusual inflorescences may vary in branching pattern and in presence or absence of dwarf leaves at the nodes.

Importance: Rock elm wood is similar in characteristics to that of American elm, but even harder. Some references say that the common name of this tree refers to wood characteristics rather than to the rocky habitat where the trees are often found. Since *U. thomasi* was never an extremely common forest tree, cutting during the past century and half has seriously depleted it as a lumber source. The fruits and seeds are eaten by some birds and mammals.



3. *Ulmus pumila* L.

Common Names: Dwarf Elm, Siberian Elm

Type Description: Linnaeus, Species Pl. I, p. 226, 1753

Origin: Northern Asia

Habitats: Roadsides, field margins and other disturbed places as an escape from cultivation

Habit: A slender shrub or small tree (escaped cultivars often with drooping limbs)

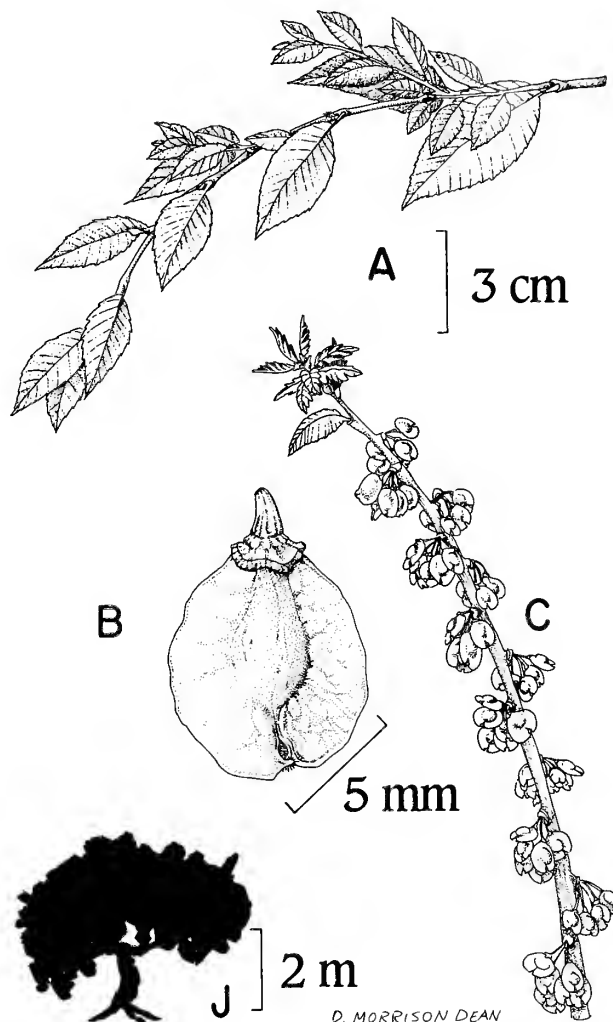
Flowering: April

Fruiting: May–June

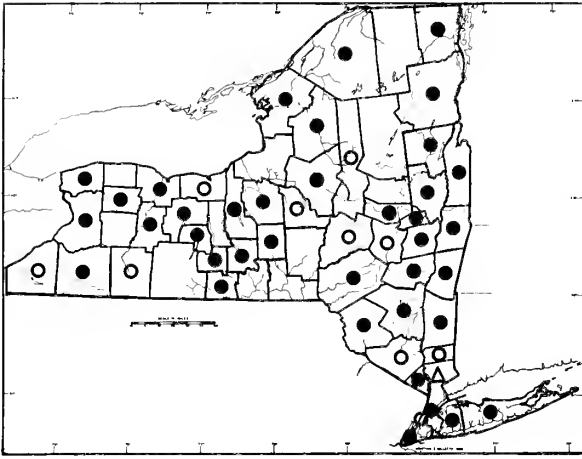
General Distribution: Scattered as an escape from cultivation in eastern North America and elsewhere; native to Siberia and northern China

Description: Plants with primarily bisexual flowers; stigmas papillate, borne on the upper style margins; styles 2, slender, ovary compressed, ca. 1.5 mm broad, glabrous; fruit a samara, 7–11 (15) mm long and broad, elliptic to ovoid, the apical notch often less than 1 mm broad (or not evident, due to incurved and overlapping styles), villous within, fruit surface glabrous, reticulate-veiny, brownish over seed, wing greenish-tan, margin smooth, not ciliate, without a distinct rim; seed ca. 5 mm long, 4 mm wide, ovate with a truncate tip; stamens 3–5, exserted, with slender filaments and spheroid anther sacs; perianth of a single series, the turbinate tube cuneate at base, purplish to green, persistent, 3–4 mm long, the 4–6 shallow lobes (sepals) glabrous or ciliate-tufted; pedicels jointed but extremely short, 0.2–0.6 mm long, flowers appearing sessile; inflorescences dense, compound fascicles borne profusely from the nodes of young stems on very short lateral shoots, subtended by a few scale-like bracts; mature leaves somewhat leathery, (1) 2–6 (8) cm long, 0.5–3.5 (4.5) cm wide, elliptic to lanceolate, only slightly inequilateral, tips acute to acuminate, bases subequal to slightly oblique, margins singly (or obscurely doubly) serrate, surfaces glabrous or slightly villous when young, the upper dark green; fall color yellow; petioles angled, villous, 3–12 mm long; stipules pale, greenish, lanceolate, ciliate, ca. 2 mm long; lateral buds 1–2 mm long, globose with several tough, red-brown, ciliate, imbricated scales; twigs and young branches red-brown to gray, at first minutely villous, soon exfoliating in slender strips; bark rough, gray-brown; trunk slender with drooping branches (in ours) and a flat crown, plants usually quite short, but up to 10 meters tall and 40 cm (d.b.h.) from a shallow root system. ($2n = 28$)

Intraspecific Variation: There are several crown types in cultivation. The leaves may be singly or weakly doubly serrate. **Importance:** This species, usually called Siberian elm, is relatively common in cultivation in New York State as a decorative shrub or small yard tree. The fruits and buds are eaten by wildlife.



D. MORRISON DEAN



4. *Ulmus rubra* Muhl.

Common Names: Slippery Elm, Red Elm, Moose Elm, Indian Elm, Sweet Elm, Swamp Elm

Type Description: Muhlenberg, Trans. Amer. Phil. Soc. 3: 165, 1793

Synonyms: *U. fulva* Michx., *U. pubescens* Walt., a *nomen ambiguum*, *U. elliptica* Koehne, not Koch, *U. heyderi* Spaeth.

Origin: Eastern North America

Habitats: Moist forests and limy riverbottoms to dry pioneering situations, roadsides and hedges, often weedy in our range

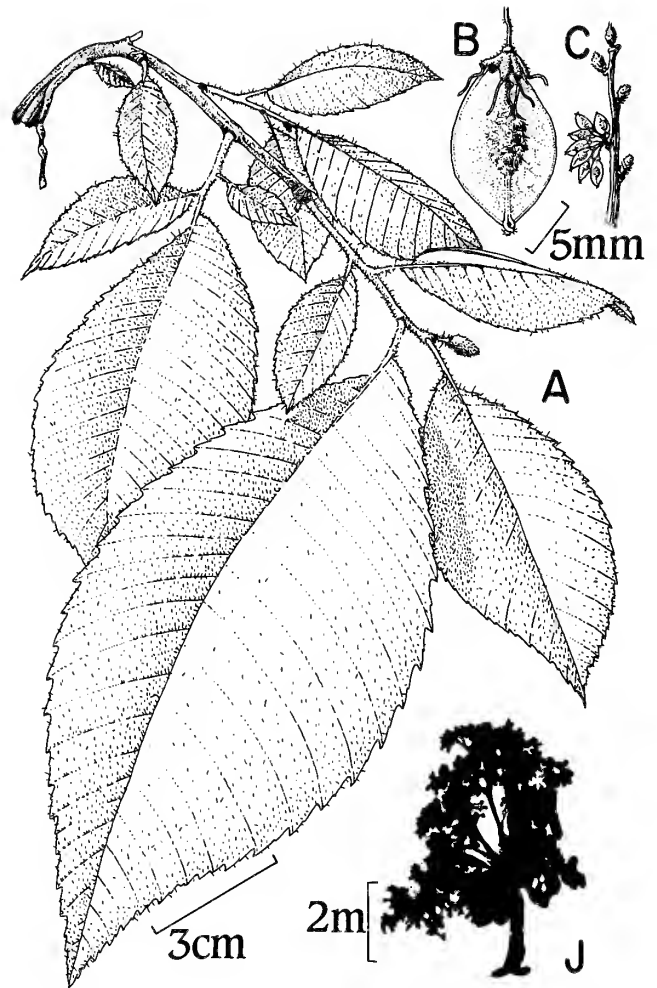
Habit: A shrub or tree with ascending, arching branches and an open crown

Flowering: April–May

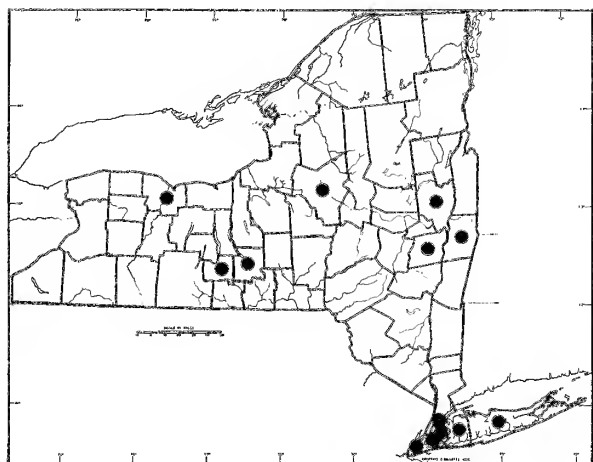
Fruiting: May–June

General Distribution: Maine to eastern North Dakota, central Texas, Louisiana and northwestern Florida

Description: Plants with **bisexual** flowers (or polygamo-monoecious); stigmas papillate, linear on the upper edges of the styles; styles 1.5–2.5 mm long, pink, persistent or withering in fruit; **ovary** compressed, 1–2 mm broad; **fruit** a samara, ovate to suborbicular, 1.2–1.8 (2.1) cm long 0.8–1.8 (2.0) cm wide with a rounded to obtuse base and tip, the styles withered or incurved upon a villous, inconspicuous terminal **cleft** 1 mm broad or less, samara surface tan, glabrous on the **wing** and margin (“eciliate”), but muricate-puberulous to densely villous and reddish-brown over the seed; **seed** ca. 3 mm long, 2 mm broad, not easily separating from the fruit; **stamens** 5–9; **filaments** slender, 2–5 mm long; **anther** sacs globose; **perianth** a funnellform tube 2–3 mm long with 5–9 well-defined, rounded lobes (**sepals**) 1.0–1.3 mm long with sharp sinuses, yellow-green, lobes reddish-tinged, margins and surfaces of perianth villous; **pedicels** jointed to the attenuated perianth base, 0.5–0.8 mm long, villous, often glandular; **inflorescence** a dense, subsessile cluster from the **inflorescence** bud which is 0.6–1.8 cm long, 0.4–1.2 cm wide, ovoid with an obtuse tip, scales imbricated, ebony covered with rusty brown villous to woolly pubescence; **inflorescence** bracts ca. 2 mm long, reddish, linear to obovate, villous with reddish hairs; **leaves** 6–16 (24) cm long, 3–11 (17) cm wide, broadly elliptic to obovate, subequal to strongly inequilateral at base, the tips acute to narrowly acuminate, margins coarsely doubly serrate, upper surface dark green, densely rough-scabrous to scabrescent, lower surface paler, scabrous to densely hirsute, especially on the veins; **petioles** mostly 3–8 mm long, hirsute and villous; **stipules** strap-like, pale greenish, 1.0–1.5 cm long, 2–4 mm wide, villous and ciliate-tufted; **lateral** buds small, red-brown, villous; **twigs** stout, densely hirsute (and puberulous), reddish to gray-brown, **young bark** exfoliating as glaucous flakes and strips, if injured peeling away revealing the extremely tough and mucilaginous inner bark (phloem); **mature bark** dark gray-brown to almost black, the flat-topped ridges nearly parallel, their fissures linear; **trunk** usually straight with ascending and arching branches and an open **crown**; shrubs or trees up to 20 (40) meters high and 20 (30) cm in diameter (d.b.h.), from a shallow **root** system. (2n = 28)



Importance: Slippery elm is usually a small to medium sized tree, whose timber is harvested along with American elm, and not distinguished from it in the trade. It is durable and tough, having been used for fence posts, railroad ties and in other situations where there might be exposure to moisture and wear. The mucilaginous bark was used as medicine by a number of American Indian groups, and their practices were taken up by the European settlers. A bark extract is pleasant to most tastes, lubricant, emollient and demulcent; it has been used as medicine, food and brewed as a tea. Uses also included its application to inflamed wounds and as a lubricant to aid in childbirth. Extract of the bark may be taken internally for a number of intestinal disorders for which more modern remedies are currently in use. The nutritional value of the inner bark has long been known, and both man and wildlife have eaten it to avoid starvation. The leaves are also good emergency forage for livestock. Buds and fruits are eaten by birds and small mammals. The slippery elm has been cultivated to some extent, but it spreads aggressively in our climate and deserves its reputation as a weed tree.



5. *Ulmus glabra* Huds.

Common Names: Wych Elm, Scotch Elm, Witch Elm

Type Description: Hudson, Flora. Angl., p. 95, 1762

Synonyms: *U. campestris* L. of authors, in part, *U. montana* With., *U. scabra* Mill.

Origin: Europe

Habitats: Woodland margins as an escape from cultivation

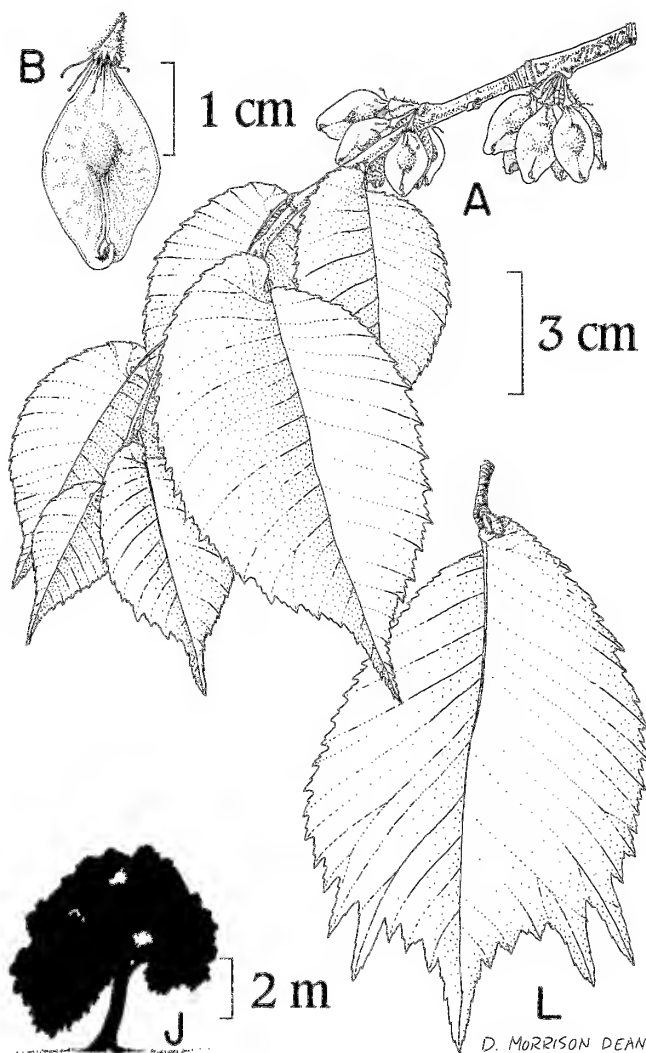
Habit: A tree with a straight trunk, **not** root suckering; the crown is variable with cultivars, being open or drooping

Flowering: April

Fruiting: (April) May–June

General Distribution: Sporadic in northeastern North America as an escape; widespread as a native in Europe and eastern Asia

Description: Plants with **bisexual** flowers; **stigmas** reddish, papillose, borne along the adaxial edges of the styles; styles 2, divergent, slender; ovary compressed, 1–2 mm long, ovate with entire margins; fruit a samara, 1.4–2.5 cm long, 1.0–1.8 cm broad, rhombic-elliptic to narrowly oval with a blunt or rounded tip and obtusely angled to rounded base, apical cleft minute, puberulent, the incurved, persistent styles often obscuring it, tiny hairs sometimes extending 1–2 mm down the central vein of the wing, the fruit surface otherwise glabrous, greenish-tan, darker over the seed; **stamens** 5–6, exserted; **filaments** slender 4–5 mm long, **anther** sacs globose, purplish; **perianth** of a single series, funnelform, 2.5–3.2 mm long, the 4–8 lobes (**sepals**) up to 1.6 mm long with rounded tips and deep sinuses, perianth surfaces greenish, sparsely pubescent to glabrous, margins ciliate and tufted; **pedicels** jointed, 0.4–0.8 mm long, densely short-pubescent; **inflorescences** dense, subsessile heads on very short lateral shoots from new growth; **inflorescence bud** red-brown, 8–11 mm long, 4–6 mm broad, scale margins villous to woolly; **leaves** 4–12 (16) cm long 3–8 (10) cm wide, elliptic to strongly



obovate, inequilateral with a strongly acuminate to cuspidate tip (or with more cusps along margins in cultivars), leaf base strongly oblique, the larger lobe often overlapping the petiole so strongly that it projects on the other side, margins coarsely doubly serrate, upper surface dark green, short-strigose, lower surface paler, villous with woolly tufts in the vein axes when young; **petioles** densely villous to woolly, 2–7 (10) mm long; **stipules** early deciduous, pale, 1.1–1.7 mm long, 3–4 mm wide, villous; **lateral buds** ca. 2 mm long, keg-shaped with red-brown, imbricated scales; **twigs** red-brown, villous when young; **bark** of branches and young **trunks** relatively smooth, without the strips and furrows that appear in older trunks; **crown** broad, oval (or in cultivars flat-topped or columnar), trees up to 40 meters tall and 2 meters (d.b.h.) from shallow **root** systems, not suckering. ($2n = 28$)

Intraspecific Variation and Hybridization: This Eurasian species is part of a complex in which there has been both natural and artificial hybridization. *Ulmus procera* Salisb. and *U. minor* Mill. cross readily within and outside their native ranges. There is therefore considerable variation in leaf shape, pubescence and habit in the complex, as well as differences in fruit shape and in the position of the seed relative to the wing. *Ulmus glabra* has been involved in the parentage of a number of hybrid cultivars including the Dutch elm (*U. × hollandica* Pallas, not Mill.). Specimens best identified as *U. glabra* × *procera* have been collected as escapes from cultivation in New York State. Among the popular cultivated variants of wych elm are: 1) a form with several elongate projections (cusps) from the veins endings near the leaf tip (cv. Cornuta), called “horned elm”, 2) a form with purple, folded leaves (cv. Atropurpurea), and 3) crown forms, including so-called “table-top” and “exeter” elms.

Importance: Wych elm, in its various cultivated forms, is commonly seen planted, and it escapes occasionally to woodlands and borders. The derivation of the common name is in dispute, with several possible (and plausible) explanations. The name “wych” may have derived from a Gallic word meaning “drooping”. In some recent works, it has been interpreted as “witch” and spelled in that way. This is undoubtedly prompted by its use in divining and dowsing for water and other underground substances. The lack of *U. glabra* for divining purposes in the New World led European settlers to turn to apple trees, native willows and witch hazel.

6. *Ulmus procera* Salisb.

Common Names: English Elm, English Cork Elm

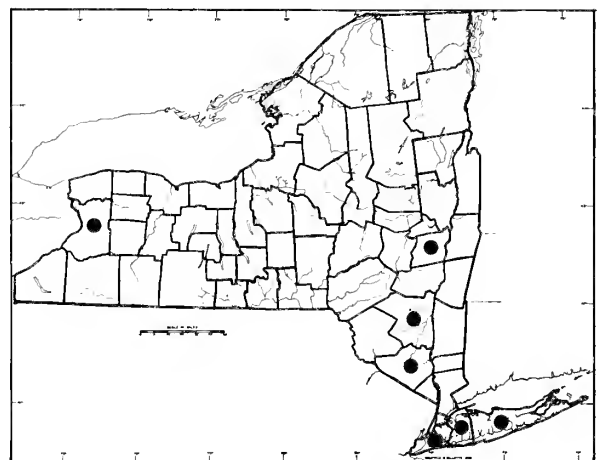
Type Description: Salisbury, Prodr. Stirp., p. 391, 1796

Synonyms: *U. campestris* L. in part, a *nomen ambiguum*,
U. parviflora of a New York report, not Jacq., *U. surculosa* var. *latifolia* Stokes

Origin: Western Europe

Habitats: Roadsides and woodland borders, as an escape from cultivation

Habit: A tree with a straight trunk and broad, spreading crown (or variously shaped crowns in cultivars), also root-suckering



Flowering: April

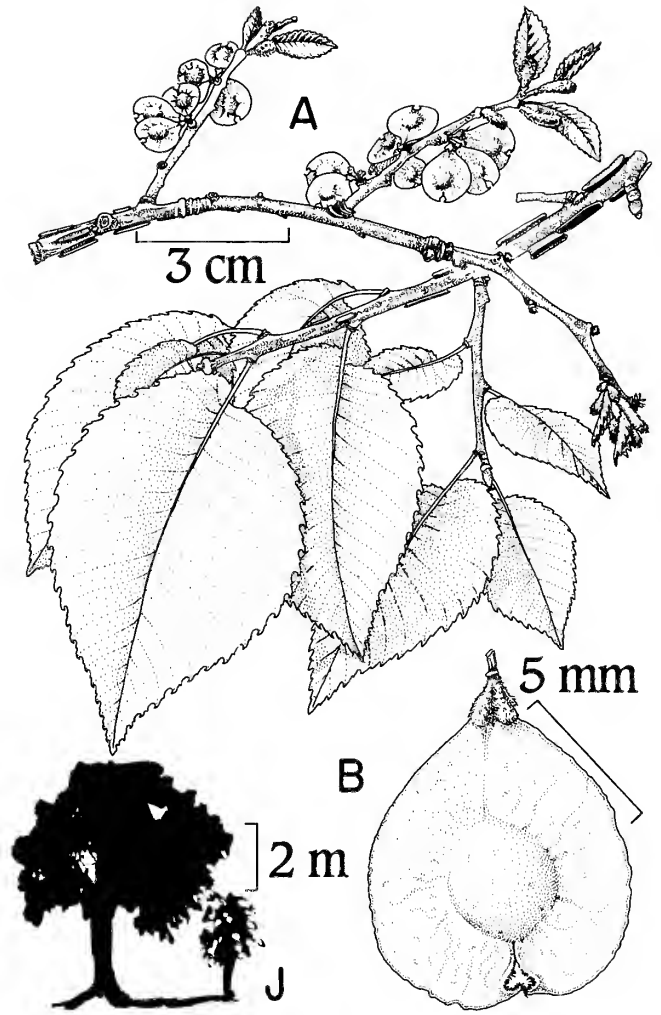
Fruiting: Late April–June

General Distribution: An occasional escape in eastern North America; native to western Europe

Description: Plants with **bisexual** flowers; **stigmas** puberulous, pale, linear on the upper surfaces of the styles; **styles** 2, slender, divergent, 0.6–0.8 mm long, persistent in fruit; **ovary** compressed, 1–2 mm long, glabrous; **fruit** a samara, 0.9–1.8 cm long, 0.9–1.6 cm broad, oval to orbicular, **wing** tan, glabrous, even over the brownish seed area, rim glabrous, persistent styles incurved toward the broadly oval **cleft** which is pubescent within and ca. 1.5 mm broad; **seed** displaced toward the fruit apex (almost never fertile in our range); **stamens** 3–5 (6), exserted, 4–5 mm long; **filaments** slender, **anther** sacs globose; **perianth** of a single series, the tube turbinate to campanulate, 2.0–2.5 mm long with 5–8 greenish-purple lobes (**sepals**) ca. 1 mm long with rounded tips and sharp sinuses, villous on the margins, persistent; **pedicels** 0.6–1.4 mm long, villous to glabrous, subtended by minute, leathery, lanceolate **bracts** with ciliate margins; **inflorescence** a dense, compound cluster of subsessile flowers borne on a very short lateral shoot; **inflorescence bud** brown, oval, its scales truncated, minutely pubescent; **leaves** 4–12 (15) cm long, 3–8 (10) cm broad, elliptic to ovate with acute to acuminate tips and oblique bases, the larger lobe rounded, but not usually strongly overlapping the petiole, margin coarsely doubly serrate, upper surface dark green, glabrous to slightly scabrous, lower surface villous when young, often with woolly tufts remaining in the vein axils into maturity; **fall color** yellow; **petioles** 3–12 mm long, villous to scabrous; **stipules** early-deciduous, pale greenish-tan to pinkish, 0.9–1.4 cm long, 1–3 mm wide, linear to spatulate, tomentose to villous, especially along the margins; **lateral buds** small with a few dark brown, minutely ciliate scales; **twigs** villous to scabrous, red-brown, often developing pronounced corky ridges after the second or third season; mature **bark** gray, ridged, flaking; **trunk** usually straight with a broad, open **crown** (cultivars vary), trees up to 40 (50) meters tall, 3 meters (d.b.h.); **root system** shallow, suckering. (2n = 28)

Intraspecific Variation and Hybridization: In Europe, there is considerable variation in these trees in the wild. Cloning through root-suckering is cited as a means of perpetuation of distinctive local populations that have been given species rank by some authors (eg. *U. plotii* Druce and *U. angustifolia* Weston). *Ulmus procera* × *glabra* is known from New York State, and hybrids involving several other Eurasian species have been reported in the botanical and horticultural literature. English elm is also one of the species involved in the parentage of Dutch elm, *U. × hollandica* Pallas.

Importance: English elm is an important cultivar with many horticultural forms. These often have distinctive leaf color, which may be variegated or remain purple or yellow throughout the season. So far, these unusual forms have not been recorded as escapes in the State. For those more typical plants, that do escape cultivation, poor seed-set is a major deterrent to rapid spread, though the trees can propagate rather efficiently through rootsuckering. The fruits and young buds are a source of food for small mammals and birds.

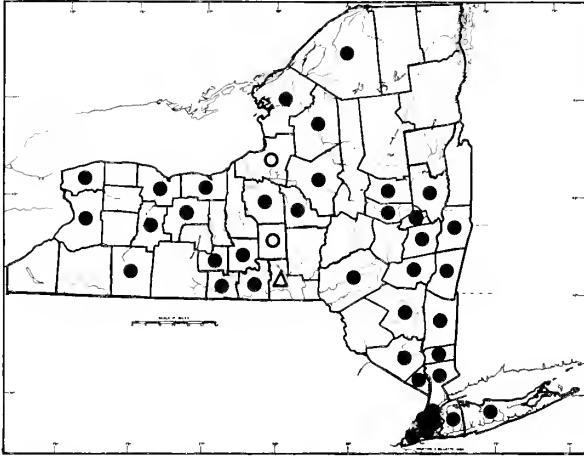


2. CELTIS

Common Names: Hackberry, Sugarberry, Nettle-tree

Authority: Linnaeus, Species Pl. I, p. 1043, 1753

A genus of 40–50 species distributed from the tropics and subtropics into temperate regions of North America and Eurasia. The two major species native to the eastern United States are *C. laevigata* Willd. of the southeast and *C. occidentalis* L., which ranges north to Canada. Both trees are of minor importance in timber production, and both are grown for ornament and shade.



1. *Celtis occidentalis* L.

Common Names: Hackberry, Sugarberry, Nettle-tree, Witch's-broom, Dogberry, False Elm, Beaverwood, Hoop-ash, One-berry

Type Description: Linnaeus, Species Pl. I, p. 1044, 1753

Synonyms: *C. canina* Raf., *C. crassifolia* Lam., *C. occidentalis* var. *crassifolia* (Lam.) Gray, *C. pumila* Pursh

Origin: Eastern North America

Habitats: Forested, rich bottomlands to rocky or sandy shores and bluffs, especially in calcareous areas (in our range)

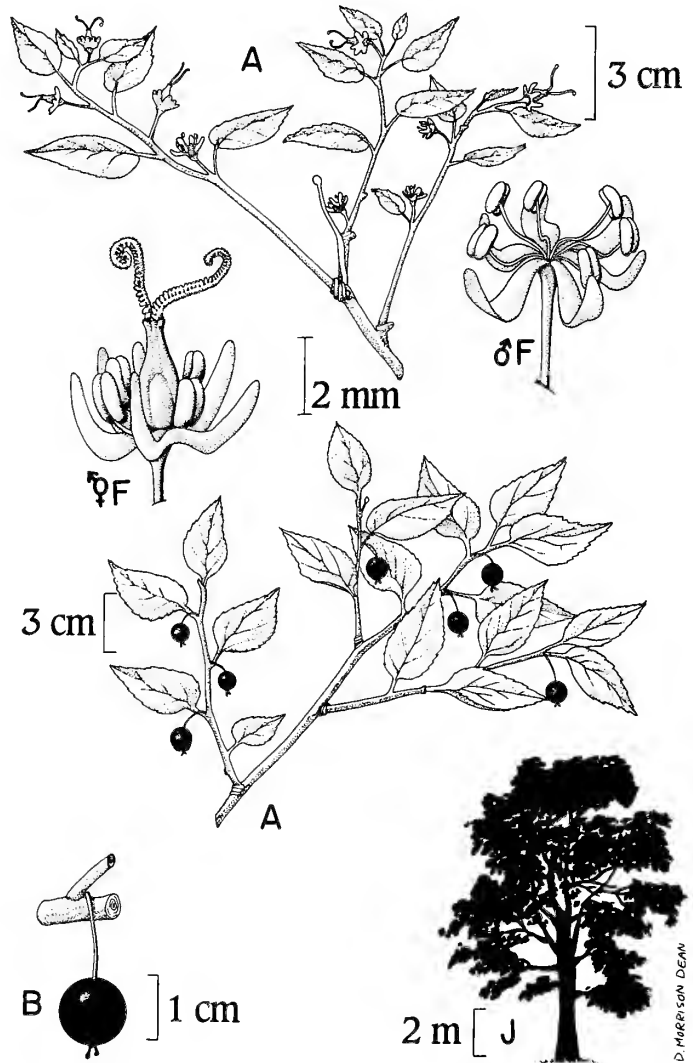
Habit: Bushy shrub to a tall tree

Flowering: April–May

Fruiting: September–October

General Distribution: Western New Hampshire and southern Quebec along the Canadian border to North Dakota, south to Oklahoma and Tennessee, with outliers in Manitoba and Colorado, Mississippi, Alabama and Georgia

Description: Plants **polygamo-monoecious**; stigmas linear, pubescent, borne on the style branches; **style** cleft nearly to the base into 2 strongly divergent, slender branches 2.0–3.5 mm long, often slightly clavate or in-rolled at tips, occasionally bifid, only their bases persistent in fruit; **ovary** ovate, constricted below the style base, glabrous, 2–3 mm long, 1–2 mm broad with 1 anatropous ovule; **fruit** a fleshy drupe, 0.6–1.3 (1.5) cm in diameter, ovoid to spherical, purple to almost black (or orange-red) at maturity with fleshy pulp, watery juice and a hard endocarp, **beaked** with the old style base, the smooth surface wrinkled upon drying into a characteristic reticulate pattern; **seed** filling the locule, 5–9 mm long, with a membranaceous surface; **endosperm** gelatinous, soon absorbed by the large, often folded cotyledons of the embryo; **stamens** 5–6, 1.5–2.5 mm long; **filaments** short, stout, **anther sacs** globose; **perianth** of a single fused whorl which is more or less connate at base with 4–6 **sepals** and narrow sinuses, the lobes cupped, 2–3 mm long, 1–2 mm wide, green to creamy-tinged, glabrous with ciliate margins, perianth eventually deciduous; **receptacle** conspicuously short-pilose, the pubescence persisting like a collar in fruit; **pedicel** jointed to the flower base, 4–9 mm long in flower, up



to 3.6 mm long in fruit, terete, villous; **inflorescences:** **bisexual flowers** borne singly or in pairs (small fascicles), mostly near the branch tips; **male flowers** borne in fascicles, usually not proximal to branch tips, differing only in lacking a fertile gynoecium; **leaves** 4–12 (14) cm long, 1.2–7.5 (9) cm broad at maturity, ovate to lanceolate, or broadly deltoid, inequilateral, bases oblique to cuneate, tips (acute) acuminate to long-attenuate, margins sharply singly serrate, often entire toward tip and base, (rarely entire throughout), 3–5 major veins usually diverging near the midrib at the leaf base, otherwise pinnately veined, upper surface dark green, sub-glabrous to rough-scabrous, lower surface paler, sparsely villous to scabrous, especially along the margins and major veins; **fall color** pale yellow; **petioles** (3) 4–13 (18) mm long, villous; **stipules** early-deciduous, scarious, villous, ca. 4 mm wide; **lateral buds** acute, minute, densely villous; **twigs** sympodially branching, villous, slender, becoming red-brown with pale linear lenticels; **branches** and young trunks with **corky warts** and layered **excrecences** up to 5 cm long; older **trunks** developing gray-brown, patchy and scaly **bark**; main **trunk** branching from near the base or straight, up to 15 (30) meters tall, 30 (60) cm. broad (maximum 130 ft by 5 ft d.b.h.) with a spreading **crown**; **root system** usually shallow. (2n = 20, 28)

Intraspecific Variation and Hybridization: Hackberries are known for their variability, especially in leaf shape and pubescence. *Celtis occidentalis* has two reported chromosome numbers, highly irregular meiosis and about 80% pollen sterility (Sax, 1933a); this puts its genetic origin and homogeneity as a species into question. It intergrades to some degree with *C. laevigata* Willd., and it has been said to hybridize with it where their ranges overlap. Major varieties of *C. occidentalis* may be distinguished as follows:

KEY TO VARIETIES

1. Fruits reddish to orange or gray-brown, spheroid; peduncles mostly 0.5–1.5 cm long; leaves coriaceous 1. *C. occidentalis* var. *occidentalis*
1. Fruits black or purple-brown; peduncles mostly 1.3–3.0 cm long; leaves membranaceous to leathery (2)
 2. Larger leaves strongly inequilateral, less than twice as long as broad, the larger leaf base broadly rounded; plants often shrubby with forked trunks 2. *C. occidentalis* var. *pumila* (Pursh) Gray
 2. Larger leaves not strongly inequilateral, mostly more than twice as long as broad, the larger leaf base usually subequal, not broadly rounded; plants often straight-trunked trees with very prominent, corky projections from the bark 3. *C. occidentalis* var. *canina* (Raf.) Sarg.

Importance: Hackberries are planted as shade trees, especially in yards and along streets; however, their appearance may be marred by a disease called “witches-broom” in which clumps of knotted branches are formed. The disease is apparently caused by a combination of factors, including mildew and infection by mites. *Celtis* wood is soft and weak, but it has been used in furniture reinforcement, as fence posts and to build barrels and crates. The berries are a good source of food for birds, and the thin, outer flesh of the drupe is edible. Seeds have also been pulverized and used as a spice. The pollen is cited in tables of aeroallergens.

Cannabaceae (Hemp Family)

A family of two genera, *Cannabis* and *Humulus*, which are sometimes included in the Moraceae. *Cannabis sativa* L., a native of eastern Asia, is economically important as a drug and fiber plant, and it has escaped cultivation over most of the temperate and tropical world. There are two species of hop. *Humulus lupulus* L., the commercial brewer’s hop, is native to both North America and Eurasia, also escaping widely. It also has medical and food uses. *Humulus japonicus* Sieb. & Zucc. is native to eastern Asia, but escapes cultivation in this country and elsewhere.

FAMILY DESCRIPTION

Annual or perennial herbs, erect or scandent-rhizomatous, lacking milky juice. Leaves opposite (sometimes decussate) on the lower stems, progressively more alternate toward the stem tips, often lobed or compound below to smaller, unlobed and even bract-like leaves among the inflorescences. Foliage and stems are pubescent with a variety of glandular and non-glandular hairs. Stipules are present, free and persistent. Plants dioecious (or monoecious), the inconspicuous flowers borne in cymose or spike-like clusters, catkins and/or panicles; female inflorescences are more compact than the males. Male flower with five stamens opposite five spiralling sepals. The female flower bears a single, unilocular ovary of two fused carpels with a common style and two stigmas. The ovule is anatropous and pendulous. The perianth is tubular, enclosing the lower part of the ovary (or much-reduced); the flower is subtended by one or more leafy or ensheathing bracts. The fruit is an achene, partially to almost completely enclosed in a thin, persistent perianth or its membranous remains. The seed contains a curved embryo and a small amount of fleshy, oily endosperm.

KEY TO GENERA

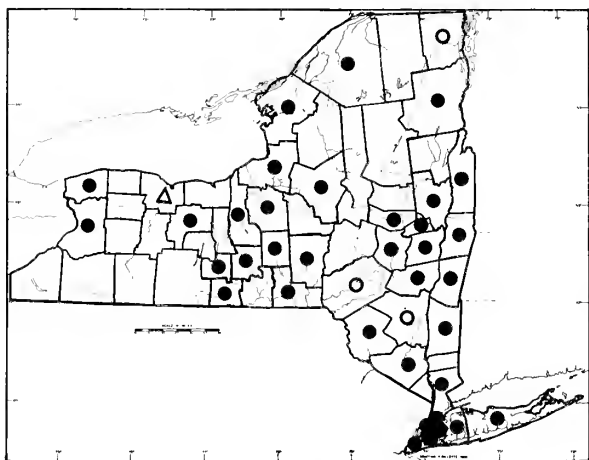
1. Leaves palmately 3–9 compound; plants erect, coarse, annual; female inflorescence erect to spreading . .1. *Cannabis*
1. Leaves merely palmately lobed or unlobed; plants scandent or sprawling-decumbent, perennial, or less often annual; female inflorescences catkin-like, often pendent, not much- branched or erect2. *Humulus*

1. CANNABIS

Common Names: Hemp, Marijuana

Authority: Linnaeus, Species Pl. II, 1027, 1753

A genus with a single, variable species, *C. sativa* L., subject to a number of taxonomic interpretations, with as many as five species recognized by some authors. As a result of selection by man through thousands of years of cultivation, the morphological and chemical variants show clusters of characteristics, making the recognition of several taxa tempting, at least at the infraspecific level. These plants are very important economically, grown widely for fiber, oil and drug content.



1. *Cannabis sativa* L.

Common Names: Hemp, Marijuana (Marihuana), India Hemp, ("Grass, Pot, Dope, Hash, Weed", etc. in the vernacular)

Type Description: Linnaeus, Species Pl. II, p. 1027, 1753

Synonyms: *C. chinensis* Delile ex Vilm., *C. erratica* Siev., *C. foetens* Gilib., *C. generalis* Krause ex Sturm, *C. gigantea* Crev., *C. indica* Lam., *C. × interstitia* Sojak, *C. lupulus* Scop., *C. macrosperma* Stokes, *C. ruderalis* Janisch., *C. sativa* var. *spontanea* Vavilov ("*C. americana*" of authors)

Origin: Probably eastern Asia, escaping from cultivation within and outside its natural range since pre-history

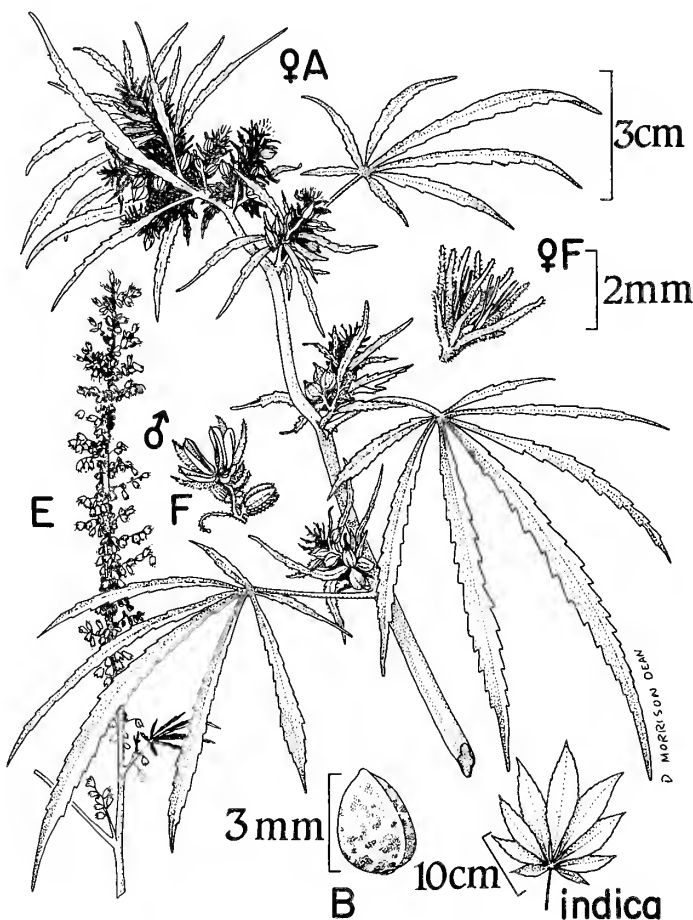
Habitats: A variety of disturbed situations in full sunlight to partial shade, especially in high-nitrogen, low-clay soils

Habit: A tall, annual herb with a taproot

Flowering: June–October

Fruiting: July–December

General Distribution: Escaping cultivation and adventive in most temperate and tropical regions of the world



Description: Plants **dioecious** (rarely **monoecious**); **female flower:** **stigmas** 2 (3), linear, 1.4–1.8 mm long, papillose, their bases fused into a short, smooth **style**; **ovary** ovoid, ca. 0.5 mm in diameter; **fruit** an achene, 4–6 mm long, 3–5 mm broad, oval to turbinate or slightly bilobed and compressed, the surface minutely reticulate, greenish-tan or yellow-brown (some with dark brown to black spots), lower half of fruit closely invested by a cupulate, membranaceous, persistent **perianth** (vestigial in some cultivars); the flower subtended by two bracts: inner **secondary bract** accrescent, 5–9 mm long at maturity, laterally sheathing, partially (to totally) enclosing the achene, cucullate (to almost completely enclosing, like a perigynium) with an acuminate tip, the abaxial surface densely covered with glandular and nonglandular hairs as well as resinous dots; outer **primary bract** lanceolate, 1.8–2.6 (3.2) mm long, 1–2 mm broad at base, with a strong midrib, adaxially glandular and pubescent; **female inflorescences:** both terminal and axillary among the upper leaves, their flowers subsessile, often borne in pairs within the dense, spike-like panicles and clusters; **male flower:** **stamens** 5, **filaments** ca. 1 mm long, slender filiform; **anther sacs** ovoid, ca. 2.5 mm long, pendulous; **perianth** of 5 sepals, free, 3.3–3.8 mm long, 0.8–1.7 mm broad, elliptic-lanceolate, greenish with paler margins (or red-purple in some cultivars), their abaxial surfaces covered with glandular and non-glandular hairs, margins ciliate, adaxial surfaces with sessile glands only; **bract** subtending the male flower lanceolate, ca. 3 mm long, 1 mm broad, with a green midrib and pale, membranous margins (or purplish); **pedicel** 0.5–3.5 mm long, pubescent and glandular; **male inflorescences:** both terminal and axillary, open to spike-like panicles and clusters, denser toward the plant apex, subtended by leaflet-like **bracts** near the summit (intergrading with leaves below); **axes** of the inflorescence densely pubescent and often glandular; **leaf** of (2) 3–13 (17) leaflets, the palmately compound blade roughly obovoid in outline, up to 50 cm broad, 65 cm long, leaflets of female plants 1–15 (25) cm long, 0.4–2.5 (5.5) cm broad, linear-lanceolate to lance-elliptic, the leaflet margins coarsely serrate over much of their length, but entire toward the narrowed base and sometimes toward the acuminate to acute tip, upper surface dark green (or reddish-purple), muricate to pustulose-glandular, glands often with apiculations or curved hairs at their tips, lower surface paler green to whitish, with dense, scabrous and glandular pubescence, sessile and stalked glands; **petioles** scabrous and glandular, somewhat grooved, 1–8 (15) cm long; **stipules** linear, 2.0–3.5 mm long, pubescent and glandular; **stems** unbranched to profusely branching from near the solitary base, coarse, grooved, pubescent and glandular to nearly smooth, often 1–2 but up to 5.3 meters tall from an annual **taproot**. (2n = 18 + XX, YY or XY; triploids, tetraploids and octoploids are known in cultivation)

Intraspecific Variation: Like many other species cultivated by man, *Cannabis sativa* is a polymorphic entity to which binomials have been applied when genetic strains show highly recognizable or clustered characters. Variation is mostly quantitative, expressed in terms of: leaflet number and size, plant height and color, numbers of hairs and glands, resin concentration, etc. Intraspecific variation has long provided a source of taxonomic confusion, fueled by breeding lore and the mythology which so often comes to surround a narcotic drug plant. Perhaps the most widely known taxonomic segregate of the species is so-called “Indica”. Known for its large size and broad leaflets, this cultivar can produce tenfold the resin of India hemp. It may be recognized as *C. sativa* ssp. *indica* (Lam.) E. Small & Cronq. Natural ploidy level variants, and those synthetically produced with colchicine, also provide a source of variation. Purple color and high resin-yield are associated with certain triploids derived through breeding or tissue cultures grown from induced chimeras. Similar plants have been in cultivation in southeast Asia for a long time. Called “black”, or named by their supposed country of origin, these dwarfs are reputedly the highest in resin (hashish) content. The distinction often drawn between hemp and marijuana is usually difficult to justify except on the basis of drug content. This separation through naming has been subject to legal as well as casual taxonomic debate, usually with the conclusion that there is a single, variable and inclusive species. The conditions under which individual plants grow may modify their appearances drastically. Phenotypic modifications are well-documented in response to drought, day-length, nitrogen depletion and clay-content of the soil. These and other factors not only affect morphology, but they may determine resin content to some extent as well. Sex determination in *Cannabis* may also come under environmental influence. Dioecious plants which are under control of a heteromorphic chromosome pair (XX or XY); however, monoecious plants have been shown to undergo sex reversals under different day-length regimes.

Importance: Cultivation of *Cannabis sativa* without a permit is a crime in the United States and in many other countries. This species has had a long history as an important, multiple-use economic plant, that yields a fiber, an oil and resinous narcotic products. The bast (phloem fiber) is 70% cellulose, with fiber strands 2 to 5 meters long produced by a single plant. The use of hemp for cloth dates far into pre-history in eastern Asia and northern Africa, and from at least 6,000 years ago in Europe. Hempen clothing was far more popular historically, but even today the finer grades are woven into a variety of fabrics, including sail-cloth. Coarser grades are used for rope, twine, nets and baskets. *Cannabis* was first introduced into North America as a fiber plant by the pilgrims in the early 1630s. Since then, it has been of only minor importance in national fiber production except during world wars, when it was encouraged as a crop and even planted by the federal government. Oil of *Cannabis* is extracted from the fruits and used as a linseed oil substitute in the paint and varnish industry. It is also added to certain feed preparations for livestock. The raw fruits were once a common constituent of

birdseed (reputedly the source of the canary's song), but any hemp seeds found in present-day birdseed mixtures have been treated to kill the embryos and drive off residual resins. Fruits are available to the scientific community (with a permit) as a culture medium for certain molds. They have been implicated as carriers in cases of Aspergillosis a rare fungal infection which can be deadly. This mycosis has been contracted by a few persons who habitually ate hemp from birdseed. Roasted fruits of hemp are eaten in some European countries without ill effects. Hemp has also been used in research on inheritance and sex-reversal in dioecious and monoecious plants. Pollen of *Cannabis* is listed as an aeroallergen, and may cause hay fever. The primary psycho-active substances in marijuana are forms of tetrahydrocannabinol (particularly Δ_9 THC), which are colorless and crystalline when purified. Although most plant parts contain THC, the highest concentrations are within glandular hairs of the female inflorescence, which contain hashish, a yellow-brown, resinous cellular by-product. The resin-rich flowers and fruits are collected and ground up or pressed into hashish cakes. This is the form in which some of the purest forms of THC travel internationally, packed in oil or allowed to mold in the air. Marijuana leaf, flower and stem materials are usually smoked directly, or less frequently they are ingested in baked goods. Although THC may be taken in pill form, it is not readily soluble in water, but it is highly fat-soluble. Oral administration in medicine and in pharmacological experiments is often accompanied by olive oil. Historically, marijuana and hashish were burned as intoxicating incense; their importance in magic and religious ceremonies is ancient. Although pure hashish may be smoked, it is often mixed with the less potent marijuana leaf or tobacco to cut its strength and cost. The effects of THC and related compounds have been the subject of considerable medical and psychological research, as well as much speculation in the popular literature. A general consensus seems to be that cannabinal, taken in small amounts, produces a slight euphoria in most persons, with a perception of enhanced visual awareness and sense of well-being. Small doses are frequently administered to terminal cancer patients in pill form to reduce anxiety. It is known that there is a dose-related increase in heart-rate with administration of THC, and that the central nervous system is also affected, with a resultant alteration of the turnover rate of major neuro-transmitters such as acetylcholine. The smoking process itself enhances the narcotic effects, through a characteristic pattern of inhalation and holding of the breath that tends to increase absorption of resins in the lungs and change gaseous blood-chemistry as well. With larger doses of THC, hallucination, slurred speech, erratic behavior, loss of visual acuity and impairment of motor skills can all occur. In some persons, continued use may lead to depression, paranoia and so-called psychological addiction. The reputation of marijuana as an aphrodisiac may involve the binding of lipophilic cannabinal with membranes and sexual hormones. This has received particular attention since estrogen levels of some male, habitual marijuana users were reported to be high, emphasizing certain female secondary sex characteristics such as breast size. When smoked, marijuana presents many of the dangers of tobacco, such as risk of emphysema and lung cancer. There is some evidence that prolonged, intense marijuana use interferes with cellular metabolism, blocking the immune system, altering DNA synthesis, and even damaging chromosomes. Another health risk involves the common practice of adulteration or "lacing" of marijuana, sometimes with very dangerous drugs. Many hundreds of tons of illegal marijuana are imported or grown in the United States each year. This lucrative business is not only tax-free, but it operates without federal regulation, considerably increasing law enforcement costs at all governmental levels. Legalization of marijuana is a complex issue with many pros and cons, and there are no quick and easy answers for the many legal and regulatory problems involved. Marijuana prohibition, like that of alcohol in the 1920s, served at first to reinforce the notion of a sub-culture outside the law, but the explosion of its availability and use in North America since the 1960s led to its widespread incorporation into the cultural fabric, transcending age and political barriers as well as socio-economic levels. Even so, marijuana use is perceived as a social blight by much of the American public. Its association with other illegal drugs is often cited, and it is difficult to predict the effects that legalization might have. A strong case against marijuana is that it is sometimes used to avoid decision-making and may interfere with personality development, especially in youth. Some states have passed legislation decriminalizing possession of small amounts of marijuana obtained for personal use. Such laws are usually written to include harsh penalties for growing or distributing the plants and their products. Forensic identification of confiscated marijuana is usually carried out by observation of plant materials under a microscope, but in instances where important legal cases are involved, the resins may be extracted with petroleum ether and subjected to chemical testing.

2. HUMULUS

Common Names: Hop, Hops

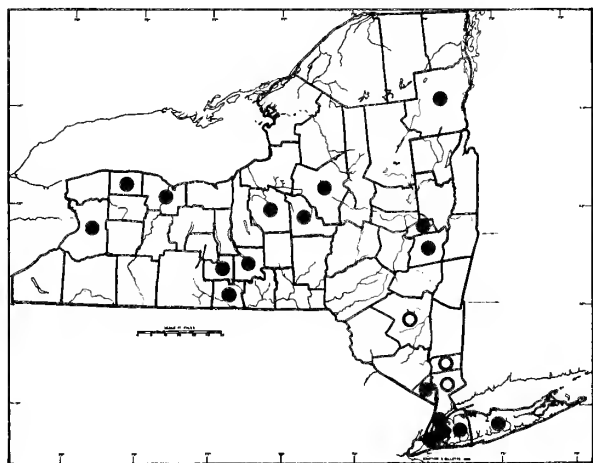
Authority: Linnaeus, Species Pl. II, p. 1028, 1753

A genus of two species, *H. japonicus* Sieb. & Zucc. of Asia, and *H. lupulus* L. of Eurasia and North America. Hops are best known as a flavoring and preservative used in brewing beer, but they are also grown as ornamental vines.

Description: Plants dioecious (rarely monoecious); **female flowers:** stigmas 2, linear, plumose, from a short style; ovary 1, superior; fruit an ovoid achene; seed with **endosperm**, with a coiled **embryo**; achene closely invested in the accrescent, tubular, often glandular **perianth**; **pedicels** short, subtended by various bracts ("bracteoles"); **female inflorescences** heads or cone-like catkins; **male flowers:** stamens 5, filaments short, anther sacs erect; **perianth** of 5 sepals, slightly coherent at base; **male inflorescences** lateral or terminal, **bracteate**, erect or drooping, cyme-like panicles; leaves simple, alternate or decussate, palmately veined, 3-7 (9) lobed or unlobed-cordate, margins serrate; **petioles** and young stems with armed trichomes, by which they become anchored as they climb; stems herbaceous, often angled, scandent or trailing, from a perennial **rhizome** or annual **taproot**.

KEY TO SPECIES OF HUMULUS

1. Fruiting bracts only partially covering the achenes at maturity, their margins bristly; lobes of the lower leaves mostly 5-7, the sinuses acute-angled; flowers usually 1 per bract. 1. *H. japonicus*
1. Fruiting bracts broad, more than covering the achenes, their margins glabrous or puberulent (not bristly); lobes of lower leaves mostly 3-5 (or unlobed) with rounded sinuses; flowers usually 2 per bract 2. *H. lupulus*



1. *Humulus japonicus* Sieb. & Zucc.

Common Names: Japanese Hop, Hops

Type Description: Siebold & Zuccarini, Abh. Akad. Wiss., Munchen 4: 213, 1846 [also described by them later in the same year: in Fl. Jap. Fam. Nat.]

Synonyms: *Antidesma scandens* Lour., a *nomen confusum*, *Humulus scandens* (Lour.) Merr.

Origin: Northeastern Asia

Habitats: Escaping along forest borders, fence rows, roadsides and in meadows, fields and waste places

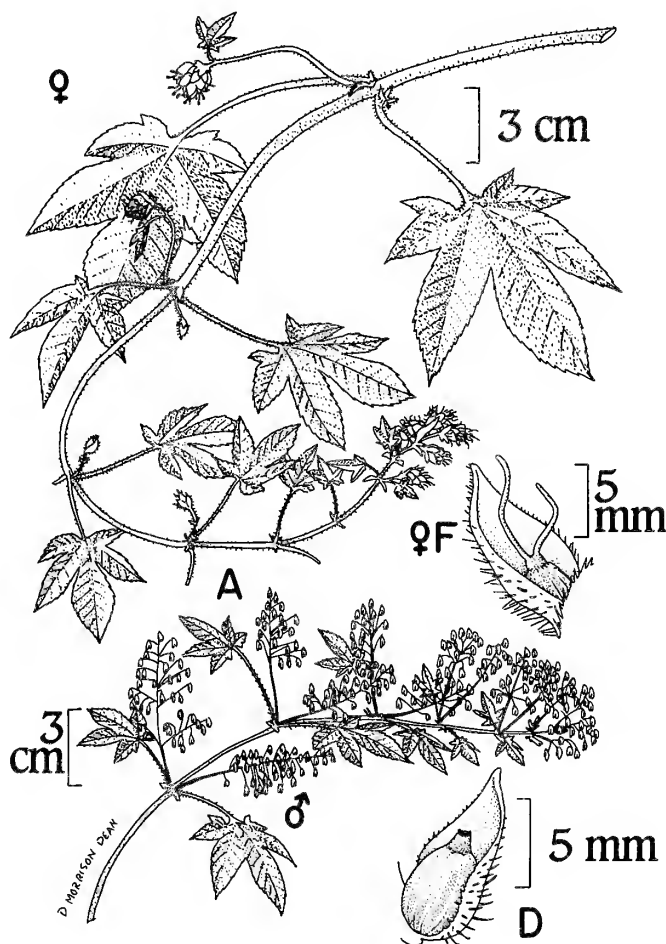
Habit: A scandent or trailing, perennial vine (rarely annual)

Flowering: July-October

Fruiting: Late August-December

General Distribution: Escaping in most temperate North America, south to the Carolinas in the eastern United States

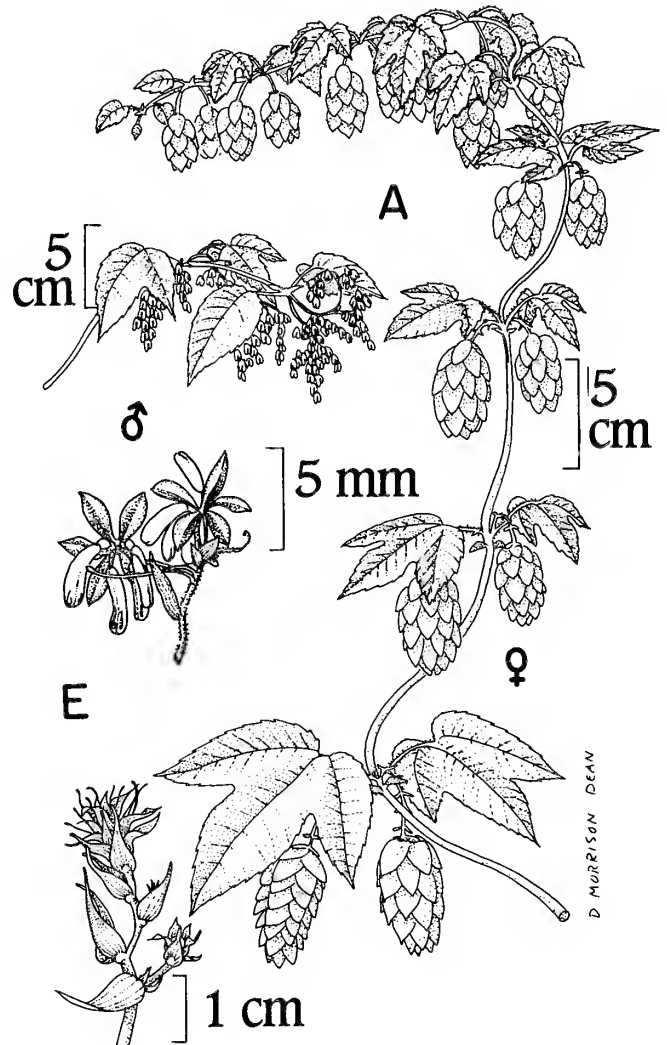
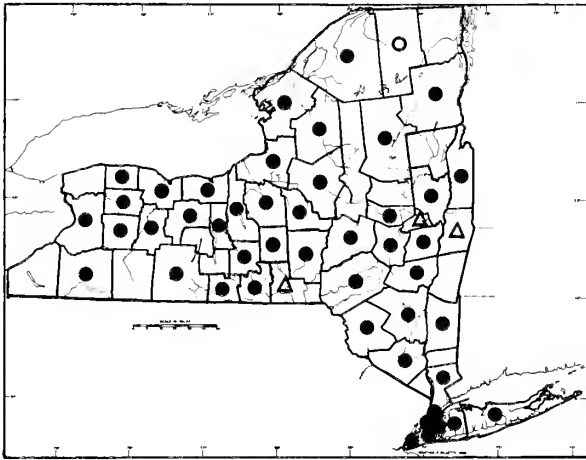
Description: Plants dioecious (rarely monoecious); **female flower:** stigmas 2, filiform, plumose, 5-8 mm long on a short style, deciduous or semi-persistent in fruit; **ovary** 1, oval, ca. 2 mm long and broad; **fruit** a lenticular achene, 5-6 mm long, 4.5-5.5 mm broad, with a single seed; achene closely invested in a membranaceous, saccate **perianth** which is smooth, veiny and greenish (turning brown); **pedicel** short, subtended by an accrescent **bract**; **fruiting bract** 7-11 mm long, 4-7 mm broad, cupulate around one side of the fruit, with 3 major veins, tip sharply acute to cuspidate, margins strongly bristly-hispid, surfaces with hispid patches, otherwise glabrous to hispidulous; smaller **inflorescence bracts** ovate to linear,



hispid; **female inflorescences** axillary (terminal), globose catkins, becoming oval to oblong, compact heads, 0.8–1.8 cm long, 0.7–1.5 cm broad in fruit, bearing (3) 5–7 (11) bracts, fruits exposed at maturity; **peduncle** densely puberulent near the inflorescence base, often not distinguishable from lateral, fertile branches except by the absence of reduced leaves; **male flower: stamens** 5, **filaments** very short; **anther sacs** subsessile, 2–3 mm long, 1.0–1.5 mm broad, cream colored; **perianth** of 5 sepals, slightly coherent at base, ovate with acute to obtuse tips, 2.4–2.6 mm long, 1.2–1.7 mm wide, cucullate, yellowish-green with paler, translucent margins, minutely glandular, villous, especially on the margins; **pedicels** very short or flowers sessile; axes of the paniculate **inflorescence** branching, varying greatly in length and thickness, mostly slender with 2-armed **barbs** and minute, scabrous to villous pubescence; panicles with a few to over a hundred flowers each, borne in the axils of reduced leaves (or terminal) small **bracts** present throughout, 4–8 mm long, 1–2 mm broad, green, scabrous; **leaves** simple, reduced upward in size and number of lobes into the inflorescence where they are difficult to distinguish from bracts; lower leaves mostly 7–15 (20) cm broad, oval, palmately (3) 5 or 7 (9) lobed, the lobes oblong, tips acute to obtuse, margins coarsely serrate, the sinuses acute angled, surfaces covered with minute glandular hairs and glands, also scabrous, especially on veins and lower surfaces; **petioles** up to 14 cm long, often longer than the leaves toward the plant apex, grooved, puberulent, with 2-armed **barbs**, each with a slender, upcurved prickle and a stout, retrorse one; **stipules** lanceolate, 4–7 mm long, 1–2 mm broad at base, with hispid margins; lateral flowering stems borne in mid-season in upper leaf axils and terminally, up to 25 cm long with 2-armed barbs, also puberulent and grooved; **stems** scandent or trailing, mostly terete below to hexagonal upward, heavily barbed, up to 5 (8) meters long, from a first year **taproot** or persisting, with a tough **rhizome** and adventitious **root system**. ($2n = 14 + XX$ or YYY)

Intraspecific Variation: The cultivar “Variegatum” has splashes of white on the leaves. Variegated plants are known as escapes in New York State.

Importance: This species has been grown as an ornamental, but it is aggressive, seeding freely and behaving as an annual weed under some conditions.



2. *Humulus lupulus* L.

Common Names: Hop, Brewer's Hops, Common Hop

Type Description: Linnaeus, Species Pl., p. 1028, 1753

Synonyms: *H. americanus* Nutt., *H. lupulus* var. *lupuloides* E. Small, *H. lupulus* var. *pubescens* E. Small

Origin: Native to North America and Eurasia

Habitats: Forest margins, thickets, stream courses, meadows (prairies) and clearings; also escaping cultivation to fence rows and waste places

Habit: Scandent or trailing, perennial vines (sometimes annual)

Flowering: July–August

Fruiting: August–October

General Distribution: Native to both Eurasia and North America: Nova Scotia to Manitoba and California, south to the Carolinas, and escaping in most temperate regions

Description: Plants dioecious (rarely monoecious); **female flower:** stigmas 2, filiform, plumose, 4–7 mm long, deciduous or semi-persistent on a short style; **ovary** 1, fusiform, ca. 1 mm long; **fruit** a spheroid achene, 3–4 mm broad, sometimes compressed near the base, containing a single seed and coiled embryo; achene closely invested in its membranaceous, saccate **perianth** whose greenish surface is punctate with golden lupulin glands; **pedicels** very short, **flower pair** subtended by a bract which is villous to tomentose on the margins, accrescent, becoming glabrescent with age; **fruiting bract** 0.8–1.8 cm long, 0.5–1.3 cm broad, oval to oblong, veiny, tough-membranous, tip obtuse to acuminate (cuspidate), surfaces glabrous to tomentulose, greenish, becoming pale tan at maturity, margins entire, (not bristly-hispid); **female inflorescences** on axillary branching systems, becoming pendent, cone-like catkins 2–5 (6) cm long, 1.5–3.2 cm broad, with up to 60 fruiting bracts, straw-colored at maturity; **peduncles** and fruiting axes of various lengths, villous, especially near inflorescence bases; **male flower:** **stamens** 5; **filaments** very slender, 0.5–1.1 mm long, **anther sacs** 1.8–2.2 mm long, 0.7–1.3 mm wide; **perianth** of 5 free, oval to obovoid lobes (**sepals**), 1.7–2.7 mm long, 0.9–1.6 mm wide, yellow-green, villous; **pedicels** and branches of the paniculate male **inflorescence** villous, varying greatly in length and width, bearing up to hundreds of flowers per inflorescence in the upper axils of the plant, lower axes with bristly-hispid hairs intergrading into 2-armed **barbs** with thick bases and two laterally oriented, slender prickles at their tips; **inflorescence bracts** and **bracteoles** minute to 5 mm long, 2 mm wide, lanceolate to lance-elliptic, pubescent, at least on margins; **leaves** reduced toward the plant apex in size and number of lobes (bract-like near the inflorescences); **upper leaves** inequilaterally ovate-cordate, serrate, with acute to cuspidate tips, unlobed or with 1–2 lobes, upper surface strongly muricate with an occasional hispid hair (or hispid in var. *pubescens*), lower surface glabrescent to hispid, strongly hispid on veins, intergrading with barbs toward the petiole; **lower leaves** usually 3-lobed (rarely 5–7 lobes), oval to reniform in outline, up to 20 (25) cm broad, bases cordate, tips acute to cuspidate, margins dentate to sharply serrate, except in the rounded sinuses, upper surface dark green, inconspicuously muricate, lower surface paler with a few villous hairs, villous to hispid along veins; **petioles** (of upper leaves) 2–7 cm long, sometimes longer than leaves, often heavily armed with barbs and puberulent, (of lower leaves) up to 14 cm long, grooved, glabrous to villous or weakly barbed; **stipules** 3–24 mm long, 1–11 mm wide, lanceolate, glabrous or pubescent on the margins; **stems** twisted-scandent, glabrous or puberulent, often with 2-armed barbs, especially toward the apex, sprawling or climbing up to 18 meters from a tough **rhizome** with adventitious roots, or annual from a **taproot**. ($2n = 20 + XX$ or XY)

Infraspecific Variation: Plants of the eastern United States usually have 3-lobed to entire leaves, whereas leaves of more western plants tend to have more lobes (3–7) and deeper sinuses, even toward the stem apex. Such plants have been designated var. *neomexicanus* A. Nels. & Cockerell. Based mostly on pubescence characters and lobing of the leaves, Small (1978) recognized three varieties which occur in our area. Eastern North American plants equivalent to *H. americanus* Nutt. are considered distinct from European var. *lupulus*, and given the name var. *lupuloides* E. Small. *Humulus lupulus* var. *pubescens* E. Small also ranges into New York from the southwest. The cultivar “Aureus” has yellow leaves. Cultivars have been bred, using a variety of parents from Eurasian and American sources, with resulting combinations of characters and growth habits, along with higher lupulin yields. Some of these are fuggle hop, English hop, cluster and late-cluster hop.

Importance: *Humulus lupulus* is the hop of commercial brewing. In the early 19th century, New York State was a leading producer of cultivated hops, but the industry moved westward, partially due to a blight. Hops impart much of the flavor and aroma to beer; flower clusters are added to the wort as it works, or later when fermentation has ceased. If hops are added early, the flavor derives partly from bitter components and breakdown products of the resins, produced during fermentation. If they are added after brewing, the flavor comes more from the plant’s essential oils and unaltered resins. The first use of hops was probably as a precipitant and spoilage retardant, added after the brewing process. Lupulin, a complex extract of hops, is known to contain components that are bacteriostatic, acting primarily against gram-positive organisms. The practice of adding hops to beer emerged historically in European monasteries around the eighth century. Roman records indicate the use of hops extract as a component in tonics considered good for the digestion. Hops were also known to the Ojibwa and other North American tribes as a diuretic and antacid; extracts have probably been used as a panacea in many parts of the temperate world since pre-history. Hops and the extract have also long been applied to wounds and sores for their antibacterial action. In Belgium and parts of eastern Europe, the ancient custom of eating hops persists in some rural areas where bleached, young catkins are boiled or added to soup. In folk medicine hops have been used to make bitter tonic with a reputation as a sedative and hypnotic. The flavonoid Quercetin is known to be a vasopressor and is present in quantity in *H. lupulus*. An extract of hops is used in dental poultices, and ground leaves have been added to tobacco as a flavoring and adulterant. Oil of *Humulus* is used in making certain perfumes of the “fougere” and “chypre” types. The phloem of *Humulus* provides a bast fiber used in weaving. Myrcine, an acyclic terpene in the plants’ hairs, may cause contact dermatitis, sometimes called hop-picker’s itch. In some persons, an allergy to beer has been directly related to hops. Pollen of hops is listed as an aeroallergen.

Moraceae (Mulberry Family)

The Moraceae: a pantropical family of woody plants and herbs with over 40 genera and 900 species. The largest genera are: *Ficus*, with up to 500 species, and *Dorstenia*, with about 100. *Dorstenia* is the only genus in the family with truly herbaceous members. In northeastern North America, the family is little known outside the horticultural world except for the Mulberry (*Morus*). *Ficus benjamina* L., the Benjamin-tree, is very commonly grown in lobbies and offices, where it has rivaled and surpassed its relative, the India rubber tree (*F. elastica* Roxb. ex Hornem.), in popularity. Cultivated fig (*F. carica* L.) has been reported as a rare escape from cultivation on Long Island. Paper Mulberry (*Broussonetia*) also escapes in the boroughs of New York City. *Maclura* and *Morus*, both treated here, are also of horticultural value.

FAMILY DESCRIPTION

Trees or shrubs (rarely herbs), almost always with milky juice in laticifers. Leaves simple, unlobed to deeply lobed or rarely compound, alternate or opposite, often with glands or hairs. Plants usually bearing flowers in catkins or globose heads, monoecious or dioecious. Perianth of 1 or 2 whorls, usually with 4 or 5 (1–8) lobes, more or less fused at base. Stamens are borne opposite the perianth lobes, often in the same number. The superior to inferior ovary is of a single carpel (or 2–3), usually unilocular, sometimes stipitate. The fruits are drupes or drupe-like achenes, often developing in conjunction with a receptacle and persistent perianth parts to form one of a large variety of syncarps (such as mulberry and fig). The seed, a pyrene, bears an asymmetrical embryo with fleshy, oily endosperm (or endosperm may be lacking).

KEY TO GENERA

1. Leaf margins entire and unlobed; stems with thorns in the leaf axils; fruit cluster a hard, globose syncarp, 7–15 cm in diameter. 1. *Maclura*
1. Leaf margins lobed or toothed; stems thornless; fruit clusters less than 3 cm in diameter. (2)
 2. Pistillate inflorescences spheroid; syncarps globose; perianths persistent, orangish, each bearing a red fruit at its mouth 2. *Broussonetia*
 2. Pistillate inflorescences short-cylindric to elongate; syncarps shortcylindric, their fruits greenish-white to rose, purple or black 3. *Morus*

1. MACLURA

Common Names: Osage-orange, Hedge-apple

Authority: Nuttall, Gen. 2: 234, 1818

A monotypic genus of North American trees (shrubs), originally native to east-central Texas and adjacent Oklahoma and Arkansas. Its nearest relative is *Cudrania tricuspidata* (Carr.) Bur. ex Lav., a native of eastern Asia. The intergeneric hybrid is known in horticulture as *Macludrania* × *hybrida* Andre. Both *Cudrania* and *Maclura* are grown as hedges and for their curious ornamental fruits; the leaves of *Cudrania* are used as silkworm food in China.

1. *Maclura pomifera* (Raf.) Schneid.

Common Names: Osage-orange, Hedge-apple, Bow-wood, Yellow-wood, Wild Orange, Hedge, Osage-apple

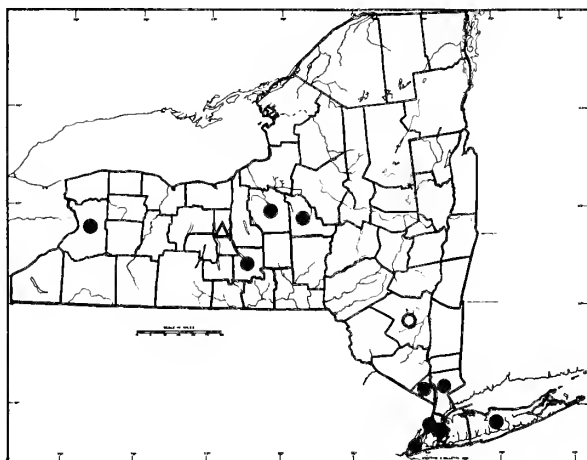
Type Description: Rafinesque, Amer. Monthly Mag. 2: 118, 1817

Synonyms: *M. aurantiaca* Nutt., *Toxylon pomifera* Raf. (*Toxylon*)

Origin: Central North America

Habitats: Escaping cultivation in the northeast, especially along hedge rows; native to disturbed water-courses in the south-central United States.

Habit: A spiny shrub or small tree with an open, rounded crown



Flowering: May–June

Fruiting: September–November

General Distribution: Originally widely distributed in central and eastern Texas (inland) to adjacent Oklahoma and Arkansas; it has firmly established itself in the southern and midwestern states after escape from cultivation, but does not often persist in the northeast

Description: Plants **dioecious**; **female flower:** stigma along the surface of the elongated style; style 1, filiform, pubescent, 6–9 mm long, deciduous; ovary 1, superior, ca. 1 mm long, glabrous; **fruit** a drupe-like achene, 3–5 cm long, compressed, linear-lanceolate, clavate, the apex 3–6 mm broad, convex, forming one of the tubercles of the surface of the **multiple fruit** (a syncarp) which is 7–13 (16) cm in diameter, mamillate, very dense, remaining green until turning yellow-brown as it disintegrates (usually after drop); **seed** oval, 8–14 mm long, near the middle of the elongate achene; **perianth** parts 4, in pairs, green, pubescent at tips, ca. 1 mm long, cucullate, the outer pair enclosing the inner, elongating with the growing fruit to equal or slightly surpass it in fruit; **pedicels** lacking; **female inflorescence:** a globose head, 0.8–1.6 cm broad (excluding styles); **receptacle** spherical, ca. 4 mm broad in flower, becoming the dense central core of the syncarp, 4.5–8.0 (9) cm broad; **male flower:** stamens 4; filaments slender ca. 1 mm long, **anther sacs** globose; **perianth** with 4 lobes (sepals), fused at base, less than 1 mm long, greenish with villous hairs, especially on and near the margins; **pedicels** 2–5 mm long with a few villous hairs; **male inflorescences** 1–2 cm broad, globose to oblong

clusters, born (singly) up to 6 (9) per node on twisted, villous **peduncles** 5–9 mm long; **bracts** at peduncle base scaly; **leaves** alternate, entire, 5–12 (15) cm long, 3–8 (9) cm broad, ovate to ovate-lanceolate, tips acute to attenuate, bases rounded-obtuse to subcordate, upper surface dark green, lustrous, becoming glabrous with age, lower surface remaining villous, especially along veins; **fall color** yellow; **petioles** villous, 2–4 (6) cm long, stout; **thorns** in leaf axils, usually single (rarely 2), tough and greenish at first, becoming brown and woody, 1–2 cm long, tapering to a stout base; **bud** small, compressed, lateral to the thorn; young **twigs** green with milky juice, their **bark** becoming gray-brown with pale lenticels; **trunk** short with deeply furrowed gray-brown **bark** and a rounded crown, 1–7 (20) m tall, up to 50 cm (d.b.h.), the wood and roots yellow, the shallow **root system** with a bright orange, exfoliating **bark**.

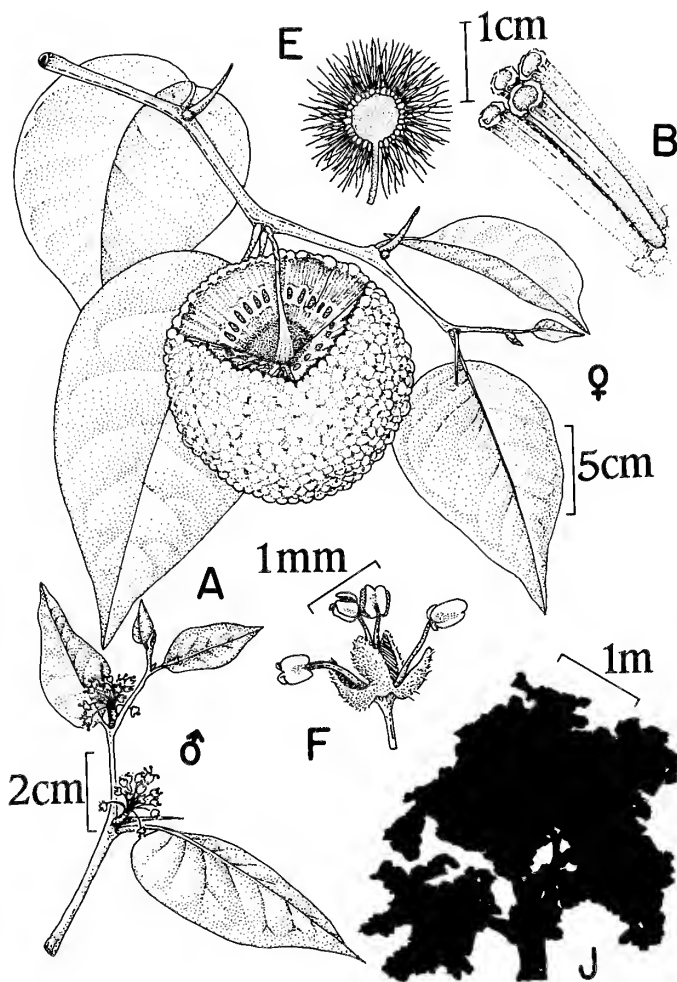
Importance: Osage-orange is often planted as a hedge, especially in midwestern and southern states. The peculiar fruits are hard for cattle to eat, but they have been suspect in some livestock deaths. These cases may not be poisonings, but instances of fruit fragments blocking the ruminant's digestive passages and trapping gases. The milky juice of *Maclura* is listed as having lectinic (cell-binding) properties, and it is reported to cause contact-dermatitis in some persons. Comanches are said to have used the juice as an eye wash. An orange-yellow dye may be extracted from the wood, roots and root-bark. The wood is highly resistant to decay fungi and contains Tetracydroxystilbene, that acts against cellulose decomposers. The wood was carved by Osage Indians, who used it for hunting bows. The pollen is listed as an aeroallergen.

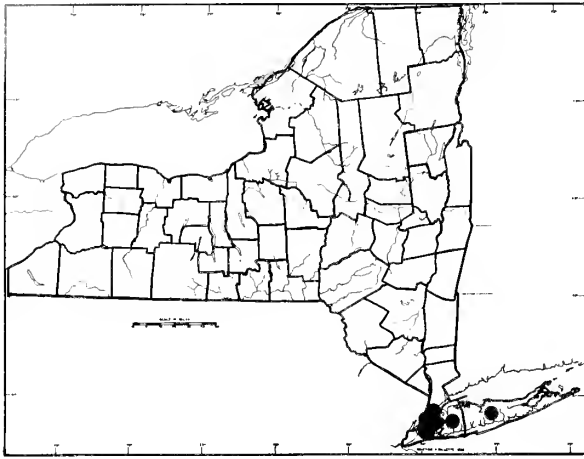
2. BROUSSONETIA

Common Name: Paper Mulberry

Authority: L'Her ex Ventenat, Tabl. 3: 547, 1799

A genus of 5 to 7 species, native to temperate Asia and Polynesia. *Broussonetia papyrifera* (L.) L'Her ex Vent. is cultivated almost worldwide as an ornamental, and its bark is used in Polynesia and elsewhere to make tapa cloth.





1. *Broussonetia papyrifera* (L.) LHer ex Vent.

Common Names: Paper Mulberry, Tapa, Tahiti Mulberry, Cut-paper

Type Description: Linnaeus, Species Pl. I, p. 986, 1753

Synonyms: *Papyrius papyrifera* (L.) Kuntze, *Morus papyrifera* L.

Origin: Eastern Asia

Habitats: Escaping to streets, vacant lots, alleys and waste places; rare in New York State, reported mostly from New York City and Long Island.

Habit: A shrub or small tree

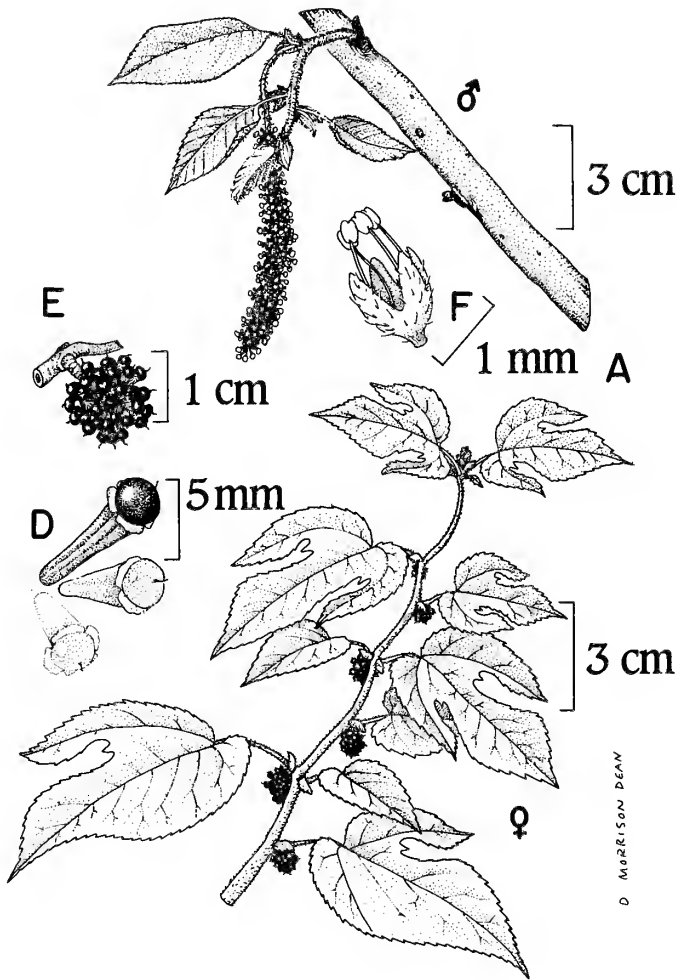
Flowering: May

Fruiting: July–August

General Distribution: Escaping occasionally over much of the eastern United States, reaching northern limits in southern New England; native to Asia and Polynesia

Description: Plants dioecious; female flowers: stigmatic area papillose, on the style; style 1, thread-like, puberulent, 4–7 mm long; ovary 1, stipitate, ca. 2 mm long; fruit a spheroidal, red drupe, ca. 3 mm broad with a reticulate, stony endocarp and seed ca. 2 mm broad, borne on a gynophore 3–4 mm long and exserted from the tip of the persistent perianth; perianth with 4 small pubescent lobes and a very short tube in flower, the glabrous, orange tube elongating and persistent in fruit, up to 8 mm long, bearing the fruit in its mouth; female inflorescence a globose head 1.3–1.8 cm in diameter in flower, up to 3.2 cm broad in fruit, subsessile, or peduncle up to 5 mm long; male flowers: stamens 4, creamy, 1.5–2.1 mm long; filaments fleshy, anther sacs globose; perianth of a single series, subsessile, ca. 1 mm long with 4 rounded, villous lobes (sepals); pedicels very short; male inflorescence a flexuous catkin, 1.8–6.5 cm long, 4–7 mm wide, greenish with pale stamens; peduncle 1–6 mm long, stout, villous, subtended by minute, villous bracts; leaves alternate to subopposite (rarely opposite), broadly ovate with acute to attenuate tips and rounded to cordate bases, singly or doubly serrate, with one or more large, open (or closed) sinuses, blade simple or irregularly 2–5 (7) lobed, 5–18 (26) cm long, 2.5–14 (21) cm broad, muricate to scabrous above (or slightly villous on veins), lower surface densely white-villous; petioles 2–10 (12) cm long; stipules ovate-lanceolate with attenuate tips, greenish, villous, 0.8–1.4 cm long, 0.4–0.9 cm broad, early deciduous, buds oval, flattened, with 2–3 tough, brown scales, minutely pubescent at their margins; young twigs with smooth bark and protruding oval lenticels; bark of the trunk smooth, brown, scaling, becoming knotty, gnarled with age (outside our range); crown spreading, round-topped; plants not reaching tree proportions in the north; root system spreading, suckering. (2n = 26)

Importance: Paper Mulberry is cultivated occasionally as a street shrub or small tree. The pollen is listed as an aeroallergen. In Polynesia and eastern Asia, the bark is made into paper, clothing (tapa cloth) and rope; the fibers are often bound together by a rice-paste adhesive.



3. MORUS

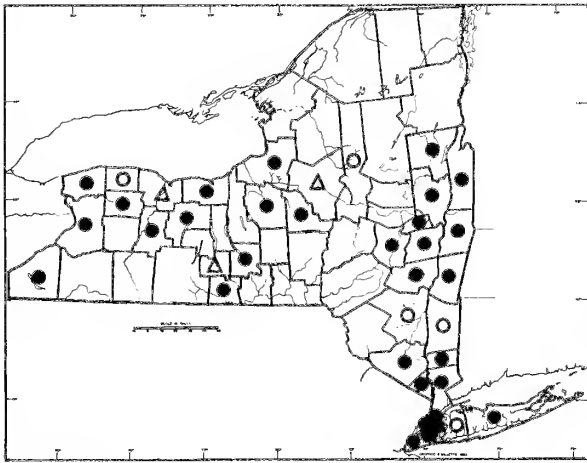
Common Name: Mulberry

Authority: Linnaeus, Species Pl. I, p. 986, 1753

A genus of about 10 species of trees, native to subtropical and temperate Eurasia and America. The two species native to North America are the widespread red mulberry, *M. rubra* L. and Texas mulberry, *M. microphylla* Buckl., which ranges from New Mexico and Arizona south into Mexico. *Morus alba* L., the white mulberry, is commonly cultivated over much of North America, where it escapes to roadsides and fields. In southern and western states, black mulberry, *M. nigra* L. is also grown, but reports of this species as an escape in New York State are incorrect (see under *M. alba*). The berries of *Morus* are edible and serve as food for wildlife. The trees are often planted as ornamentals despite their dirty aspect when in fruit. Leaves of mulberries are a primary food source for commercially grown silkworms.

KEY TO SPECIES OF MORUS

1. Lower leaf surfaces glabrous, pubescent only on veins and in their axils; fruits greenish-white (to pink-tinged) or dark purple-tinged to black. 1. *Morus alba*
1. Lower leaf surfaces soft pubescent; fruits rose-red to red-purple when ripe 2. *Morus rubra*



1. *Morus alba* L.

Common Names: White Mulberry, Russian Mulberry, Silkworm Tree

Type Description: Linnaeus, Species Pl. I, p. 986, 1753

Synonyms: *M. alba* var. *tatarica* (Pallas) Ser., *M. nigra* of New York reports, not L., *M. tatarica* Pallas, not L.

Origin: Eastern Asia

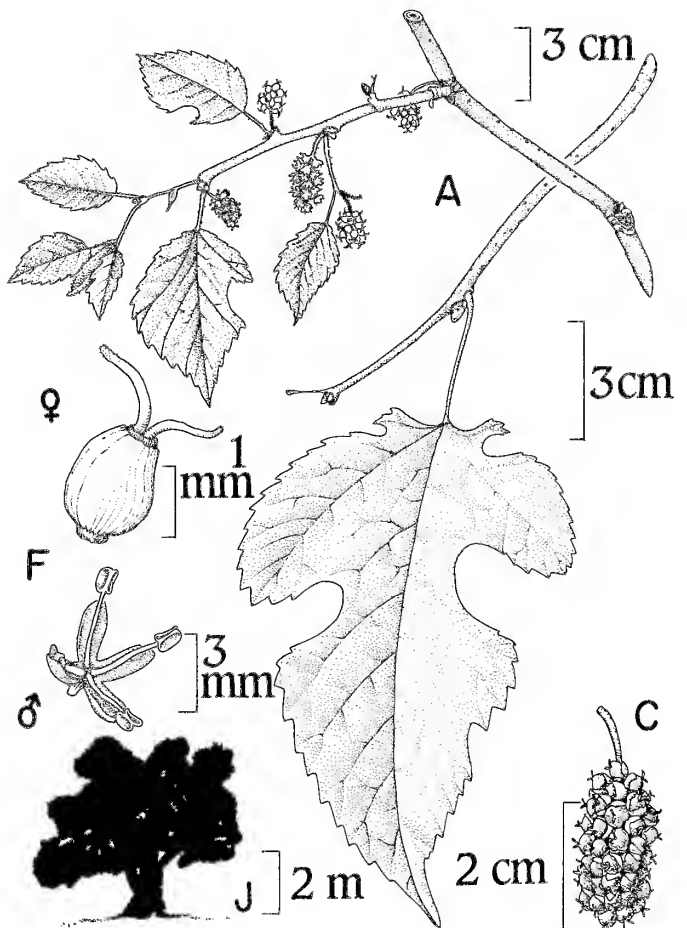
Habitats: Escaping cultivation in disturbed habitats such as roadsides, dumps and vacant lots, especially in urban areas

Habit: A small tree with a broad, round-topped crown (cultivars vary from pyramidal to flat-topped, drooping crowns)

Flowering: May-June

Fruiting: July-August

General Distribution: Escaping cultivation over most of eastern North America, less common northward into Canada



Description: Plants **monoecious** or **dioecious**; **female flowers:** **stigmas** 2, inconspicuous; **styles** 2, filiform, curling, ca. 1 mm long, somewhat persistent; **ovary** 1, ovoid, 1.5 mm long, 1 mm broad; **fruit** an achene, ca. 2 mm broad, 1 mm thick, ovoid-lenticular, hard-coated over the **seed**, surrounded by a fleshy-walled, accrescent perianth and slightly exserted at its tip; **perianth** of a single series, shallowly 4-lobed, connate over much of its length, 1.5–1.8 mm long in flower, accrescent to form a swollen, urceolate sac, the resulting, drupe-like **accessory fruit** 1.8–3.4 mm long, 1–3 mm broad, its base usually compressed by the other fruits of the head, but not coherent with them; **female** (or perfect-flowered) **inflorescence** an oval to cylindric head, 7–14 mm long, 5–9 mm broad, becoming a loose to dense, cylindric syncarp in **fruit**; syncarp greenish-white to rose-tinged (less often dark purple to black), 1–3 cm long, 0.8–1.5 cm broad, juicy; **male flowers:** **stamens** 4; **filaments** slender, 2–3.5 mm long, **anther sacs** globose; **perianth** deeply 4-lobed nearly to the base, lobes creamy-greenish, cucullate, 2–3 mm long, ca. 1 mm wide; **male inflorescence** a cylindric, flexuous catkin, 1–3 cm long, ca. 1 cm wide; **peduncle** (male and female inflorescences) villous to puberulous, mostly 5–13 mm long, produced on greenish short-shoots or singly; **bracts** subtending the inflorescences lanceolate, villous, 3–4 mm long, 1 mm broad, early-deciduous; **inflorescence buds** with 3–4 brown, leathery scales, 3–5 mm broad, with darker brown margins; **leaves** simple, alternate, oval to ovate-lanceolate, often inequilateral, 4–12 (22) cm long, 3–9 (14) cm broad, tips acute to attenuate, bases obtuse to truncate or cordate, often oblique, margins irregularly, coarsely serrate, often shallowly to deeply cut with rounded sinuses, 1–9 lobed, upper surface glabrous, minutely muricate, lower surface glabrous but with velutinous hairs along the major veins and tufts in their axils; **petioles** 1–5 (10) cm long, ribbed, sparsely to moderately velutinous; **stipules** lanceolate, 4–8 mm long, pale green, sericeous, early-deciduous; **axillary buds** with 3–6 reddish-brown scales, ovoid, 3–4 mm long; young **stems** and **twigs** reddish-brown, tan or grayish with ridged young **bark** which later becomes dark and scaly on mature **trunks**; a small tree, up to 10 (16) meters tall with an open, rounded **crown** and shallow **root system**. (2n = 28)

Infraspecific Variation: This tree has a number of horticultural variants which sometimes escape. These are mostly recognized by crown shape, leaf size and lobing. The so-called Russian mulberry, sometimes separated as *M. alba* var. *tatarica* (Pallas) Ser., is a compact shrub or small tree with mostly undivided leaves and characteristically dark fruits. It is hardier in cultivation in northern North America than typical *M. alba*. New York State reports of the black mulberry, *M. nigra* L., have so far all been based on misidentified specimens of this plant.

Importance: White mulberry has been planted as an ornamental in North America since colonial times. Various races of the species have been grown for different purposes, including use as food for the commercially grown silkworm. The form known as Russian mulberry was introduced in the 1870s, and it is grown in shelter belts in the midwestern and western states today. The wood is used for fence posts, rails and short beams. The white berries are usually not tasty, but, some Russian mulberries produce juicy, black fruits, which may be eaten or baked into pies. Young shoots are cooked as a vegetable in Asia.

2. *Morus rubra* L.

Common Names: Red Mulberry, American Mulberry

Type Description: Linnaeus, Species Pl. I, p. 986, 1753

Origin: North America

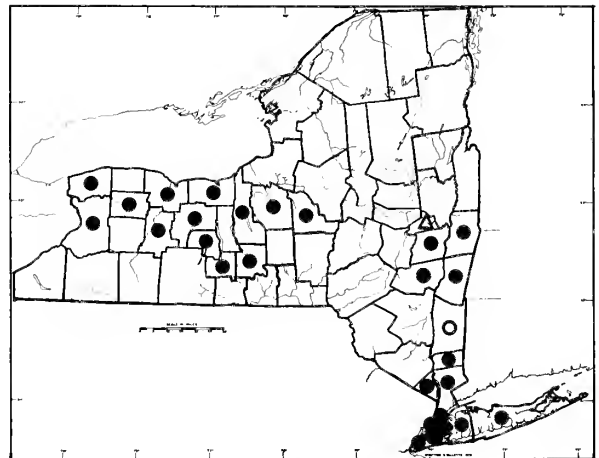
Habitats: A variety of woodlands and borders, particularly in rich soils

Habit: A small to large tree with a broad, spreading, oval crown

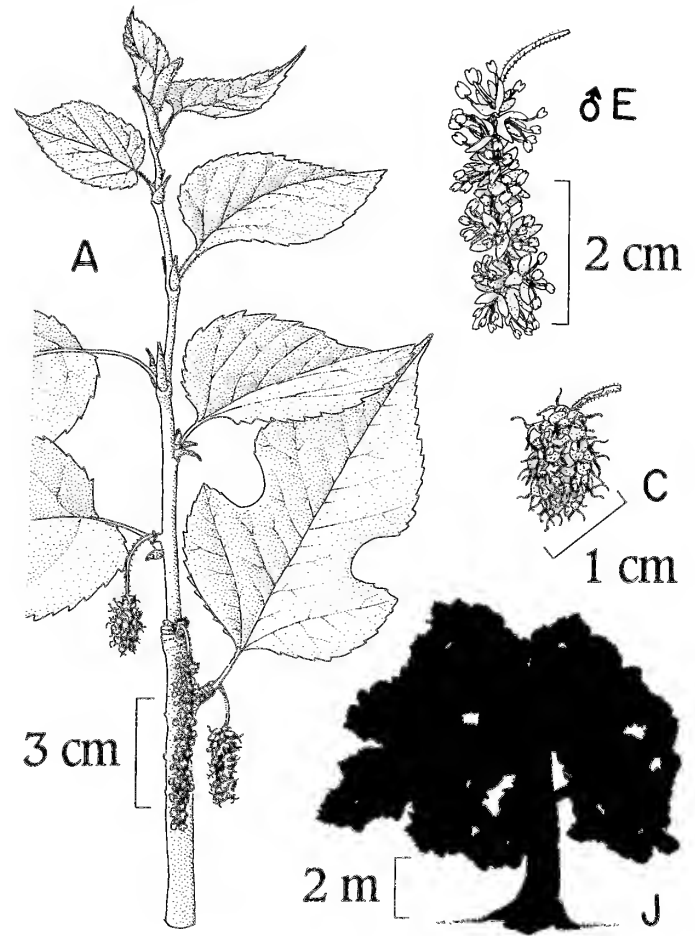
Flowering: May

Fruiting: Late June–July

General Distribution: Southern Vermont to Minnesota and Nebraska, south to Texas and peninsular Florida



Description: Plants monoecious or dioecious; **female flowers:** stigmas 2, inconspicuous; styles 2, filiform to ligulate, ca. 2 mm long; ovary ovoid, 1.2–1.5 mm long, 0.8 mm wide; fruit a pale achene, 1.5–2.1 mm long, ca. 1 mm broad, irregularly lenticular, tightly enclosing the single seed, surrounded by a fleshy, accrescent perianth, and slightly exerted from it at the tip; **perianth** of a single series, 4-lobed, fused into a connate base, accrescent, becoming juicy, purple, enclosing the achene, the resulting **accessory fruit** 1.5–3.8 mm in diameter, somewhat compressed between the other fruit of the head, but not coherent with them, the exposed surface flattened, glossy; **female inflorescence** (or bisexual) a short catkin 5–9 mm long, 3–6 mm broad, becoming a dense, juicy syncarp in fruit, 1.1–2.8 (3.8) cm long, 6–14 mm broad, dark red to purple (rarely paler or very dark); **male flowers:** stamens 4, ca. 3 mm long; filaments linear above, more or less coherent with the perianth lobes within, or appearing to attach at their tips, anther sacs globose; **perianth** 4-lobed, the lobes cucullate, greenish with a fringe of pubescence, ca. 1.5 mm long, the bases slightly connate, the flowers subsessile; **male inflorescence** a flexuous, yellow-green catkin, 2–4 cm long, 0.7–1.1 cm broad; **peduncles** of male and female inflorescences 6–18 mm long, villous to woolly, terete and stout in females or flattened and early-deciduous in males, borne in leaf axils; leaves broadly oval to elliptic-cordate, 5–15 (20) cm long, 3–13 (18) cm broad, tip and lobe-tips strongly attenuate (acuminate), the margin coarsely serrate, often deeply divided into 1–5 (9) obspatulate lobes with rounded sinuses (“turkey-foot” pattern), upper surface darker green, sparsely scabrous to muricate or nearly glabrous, lower surface villous throughout, densely villous to woolly along veins; **petioles** villous to woolly, mostly 1.0–3.5 cm long; **stipules** linear-lanceolate, 6–11 mm long, pale green to reddish-tinged, sericeous, early-deciduous; **axillary buds** oval with acute tips, tan with 3–6 bud scales which are dark brown at the margins; **twigs** pubescent at first, becoming reddish to gray-brown, often twisted, the young bark flaking, leaf scars prominent; older **trunks** with scaly, grayish to almost black bark; **crown** broadly spreading, oval, tree up to 25 meters, 2 meters (d.b.h.), sometimes buttressed, from a spreading, fibrous root system. ($2n = 28$)



Importance: Red mulberry is well-known in cultivation, even though it has some undesirable qualities as a yard and street tree. It is an excellent provider of shade when mature, but its prolific yield of fruits makes it a very dirty tree, which is especially troublesome when shading sidewalks and driveways. Stains produced by the fruits are particularly difficult to remove from clothing, cement and automobiles. When a tree is fruiting, it can attract many hundreds of birds who, in turn, spread seeds and stains as they go. The fruits are not only valuable to wild birds and small mammals, but they are harvested as food for domestic poultry and livestock. They are edible to humans, but easily perishable and not of commercial value. They are sometimes boiled for juice to be used in jelly, berry-sauce or wine. The wood of *M. rubra* is tan to yellow-orange. Although mulberry wood has been used as a veneer, much of the so-called mulberry in the furniture trade is actually maple.

Urticaceae (Nettle Family)

The Urticaceae: a family of mostly herbaceous plants, some known for their stinging hairs. The group comprises some 45 genera and perhaps 600 species, most of which are tropical; only a few representatives of six genera have distribution ranges extending into the United States. Species of *Hesperocnide* are found on the Pacific Coast and in Hawaii, while *Urtica* and *Parietaria* span the continent. *Boehmeria* and *Pilea* are genera with mostly southern distributions, but one or two species of each occur in eastern and central North America. Although *Laportea* has species that are more tropical, our representative of the genus is closely related to Asiatic taxa, associated with ancient, temperate and boreal Arctotertiary floras. The largest genus of the family is pan-tropical *Elatostoma*, with possibly 300 species. Like *Elatostoma*, *Pilea* is a large tropical genus (ca. 200 species), some members of which are popular in horticulture. Ramie [*Boehmeria nivea* (L.) Gaud.], originally native to China, is an important fiber-producer which has become naturalized in the southeastern United States. The popular houseplant called baby's-tears (*Helxine soleirolii* Req., native to Sardinia) is another familiar member of the Urticaceae.

FAMILY DESCRIPTION

Annual or perennial herbs (less often shrubs, small trees or vines). In some genera, stalks and leaves may bear one or more types of specialized, stinging hairs; tissues contain mucilage and cystoliths, and may be mineralized with silica; laticifers may be present, but juice is usually watery. The leaves are simple, opposite or alternate with stipules (except *Parietaria*). Plants are monoecious, dioecious or polygamous with cymose, racemose or panicle inflorescences; flowers are borne loosely or tightly, clustered in glomerules, borne on a common receptacle (or singly). Inflorescences are primarily axillary. Flowers are small, usually unisexual, often greenish or reddish. Perianth parts are usually 3–5, free or fused into an accrescent sac in female flowers; the perianth may also be absent or reduced to staminodes. Stamens are usually as many as the perianth parts and opposite them. The ovary bears a single style (or style absent), a capitate or filiform stigma (rarely 2) and a basal ovule. The fruit is an achene, nutlet or drupe that may be loosely or tightly enclosed by the persistent perianth. The poorly-differentiated seed contains a large embryo and thin, oily or starchy endosperm.

KEY TO GENERA

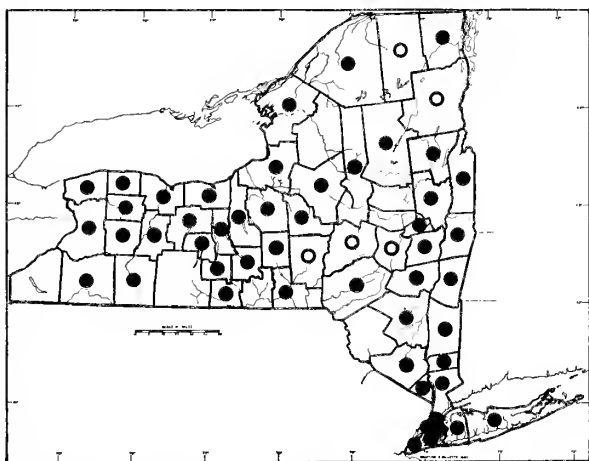
1. Flower clusters on unbranched, spike-like inflorescences (shoots) which are borne singly in the leaf axils (spikes may be leafy-tipped in fruit). 1. *Boehmeria*
1. Flower clusters borne in branched or aggregated inflorescences in the leaf axils. (2)
 2. Leaves of the mature stem opposite or sub-opposite (4)
 2. Leaves of the mature stem obviously alternate. (3)
3. Stiff, stinging hairs with swollen bases present on the inflorescence branches and leaves; achene bilaterally distorted, pouch-like; sepals free at base, not enclosing the achene 2. *Laportea*
3. Stiff, stinging hairs absent; achene lenticular-elliptic; sepals fused at base, partially to almost wholly enclosing the achene 3. *Parietaria*
 4. Stigma tufted; stiff stinging hairs with jointed, swollen bases present on petioles and inflorescence branches 4. *Urtica*
 4. Stigma linear; stinging hairs absent (or a few, minute irritant prickles on leaf surfaces) 5. *Pilea*

1. BOEHMERIA

Common Name: False Nettle

Authority: Jacquin, Enum. Syst. Pl. Inst. Carib., p. 9, 1760

A genus of mostly tropical distribution, with 80–100 species some of which range into the temperate zones of the Northern and Southern Hemispheres: rare in Africa and absent from Europe. The genus is taxonomically difficult in Asia, where polyploidy and apospory are involved. Ramie [*Boehmeria nivea* (L.) Gaud.] is a native of China, introduced widely in the tropics and subtropics as a source of fiber. It escapes cultivation south of our range.



1. *Boehmeria cylindrica* (L.) Sw.

Common Names: False Nettle, Bog-hemp

Type Description: Linnaeus, Species Pl. II, p. 984, 1753

Synonyms: *B. cylindrica* var. *drummondiana* (Wedd.) Wedd., *B. drummondiana* Wedd., *B. scabra* Small, *Urtica cylindrica* L.

Origin: North America

Habitats: Woodlands, streamsides and swamp borders, usually in cool, shady situations, but sometimes in open woods and swales

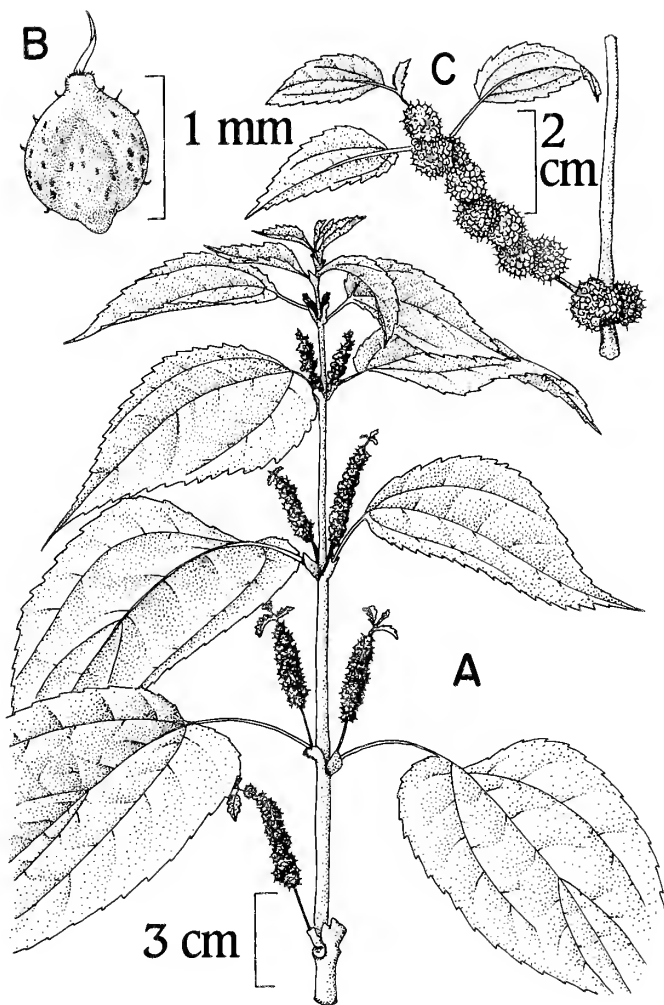
Habit: An erect or ascending, perennial herb from a caudex or rhizome system

Flowering: July–September

Fruiting: August–November

General Distribution: Maine and southern Quebec, Minnesota and Nebraska south to Mexico, Honduras, Florida and the Bahamas (also disjunct in South America south to Argentina)

Description: Plants **monoecious** or **dioecious**; **female flowers:** stigma 1, papillate and pubescent, 0.4–1.1 mm long, marginal to the style, persistent, up to 1.5 mm long and sometimes recurved at the tip, especially in fruit; **ovary** sessile or stipitate, elliptic, enclosed in the perianth; **fruit** an achene ca. 0.7 mm long, closely invested in the accrescent, saccate, reddish-green **perianth**; perianth urceolate-lenticular, becoming fleshy, ca. 1 mm long, 0.8 mm broad, slightly larger than the achene, enclosing it completely, only the stigma and style protruding beyond its narrow mouth, the mouth tufted, perianth surface golden-brown over the achene with distinct greenish to brown margins, with hairs, many of which are hooked at their tips; **bracts** of the flower cluster pubescent, varying in size, the outer ones up to 2 mm long, lanceolate to ovate-cucullate, some of them persistent into fruit; **male flowers:** rudimentary ovary tissue often present; **stamens** 4 (5), opposite the sepals; **filaments** thick, **anther sacs** globose; **perianth** of 4 (5) lobes (**sepals**), fused at base, ca. 1.5 mm long, 1 mm broad, ovate-cucullate, creamy-greenish with hooked hairs, valvate in bud; **bracts** lanceolate, pubescent, ca. 1 mm long; **inflorescences** of fascicles of male, female (or mixed) flowers, male flowers often preceding the females in the same cluster; fascicles borne on modified **axillary flowering branches** which are spike-like, but often bear leaves at their tips; **flowering spikes** (0.5) 1–8 (18) cm long, 0.5–0.9 cm broad, often interrupted, especially between nodes bearing male flower clusters, the predominantly female branches cylindric and hardly interrupted in fruiting condition; **bracts** scarious, lanceolate, 1–2 mm long, sparsely pubescent; **reduced leaves** often produced in the flower spike at and near its tip; **leaves** opposite, decussate (less often sub-opposite or alternate) ovate to elliptic-lanceolate, 3–13 (16) cm long, 2–7 (10) cm broad with rounded to cuneate (truncate or sub-cordate) bases and acute to cuspidate tips, midrib flanked by 2 large veins arching from its base, margin coarsely serrate to dentate, upper surface dark green, glabrescent to sparsely pilose or scabrous, showing a profusion of minute cystoliths when dry, lower surface paler, glabrous to sparsely pilose, mostly on veins and margins; **petioles** (0.4) 1–7 (11) cm long, slender, grooved, puberulent; **stipules** 2 (or fused, with a



bifid tip), linear-lanceolate, fugaceous, caducous or clinging; stems usually unbranched, erect or ascending, minutely grooved to deeply canaliculate, glabrous to minutely pubescent, up to a meter tall from a **caudex** and **rhizome** system with fibrous roots. ($2n = 28$)

Infraspecific Variation: Petiole length is variable, the short-petioled plants sometimes distinguished as var. *drummondiana* (Wedd.) Wedd. The so-called inflorescence spikes are fertile, axillary shoots which frequently bear dwarf leaves at their tips. They may even leaf out completely if the apex is damaged. Rarely they are very short, giving the appearance of clusters rather than spikes. Leaves may occasionally be alternate or sub-opposite rather than decussate. Pubescence is also quite variable.

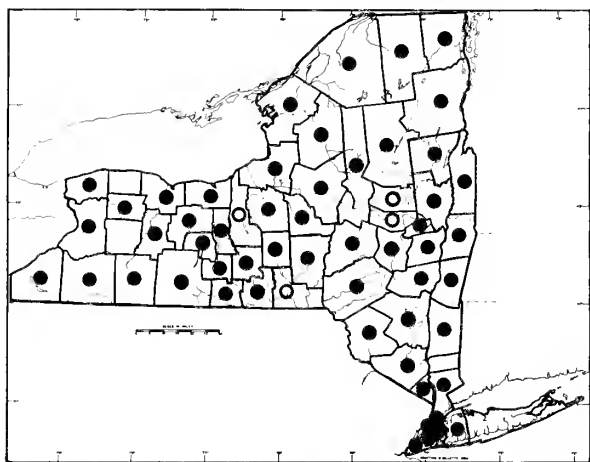
Importance: *Boehmeria* is listed as a producer of cryptopleurine, a drug used in cancer therapy.

2. LAPORTEA

Common Names: Wood-nettle, Giant Stinging-nettle

Authority: Gaudichaud ex Freycinet, Voy. Monde Bot., p. 498, 1830

A genus of 20–25 species, if interpreted to include taxa sometimes segregated as *Fleurya*. Tree species of the Southern Hemisphere once included in *Laportea* are currently placed in the genus *Dendrocnide*. *Laportea canadensis* (L.) Wedd., the only species within our range, has its nearest relatives in eastern Asia. Even though more tropical species of the genus range northward onto our continent, it is likely that our native species came by way of the Arctotertiary route. *Laportea* is best known for its powerful stinging hairs, borne on the leaves and especially in the inflorescence.



1. *Laportea canadensis* (L.) Wedd.

Common Names: Wood-nettle, Giant Stinging-nettle, Canada-nettle, Albany-hemp

Type Description: Linnaeus, Species Pl. II, p. 985, 1753

Synonyms: *Urtica canadensis* L., *U. divaricata* L., *Urticasterum divaricatum* (L.) Kuntze

Origin: Arctotertiary Forest (native North American)

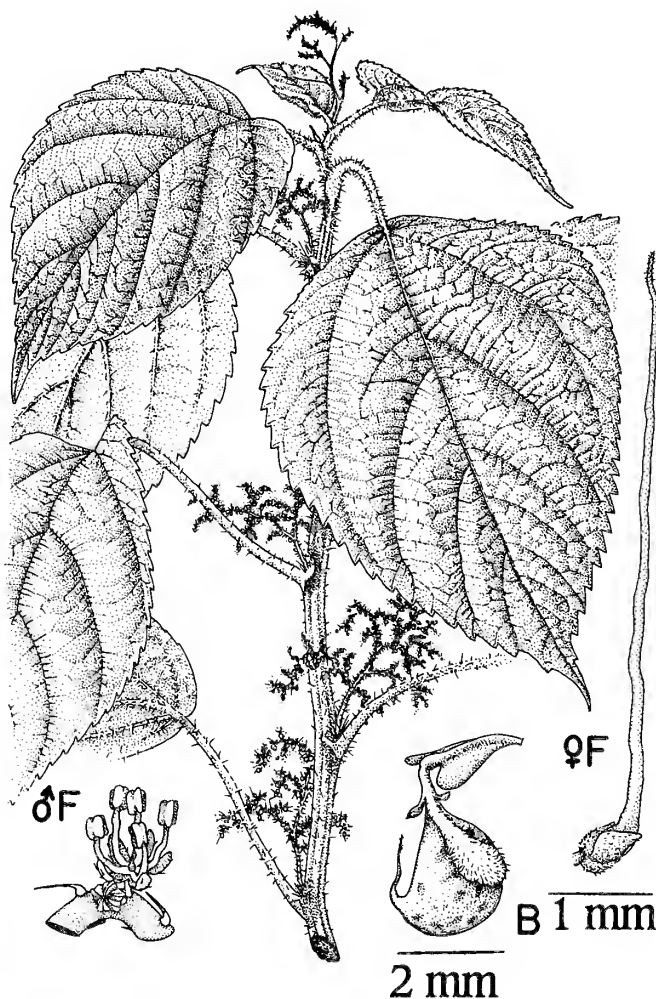
Habitats: Cool, moist woodlands in full shade to mesic woods and partial shade, commonest along stream banks and in wet depressions

Habit: Tall perennial herbs, stiffly upright or ascending, often occurring in dense colonies

Flowering: July–September

Fruiting: August–November

General Distribution: Nova Scotia and St. Pierre to Manitoba, south to Oklahoma and north Florida in the uplands



Description: Plants **monoecious** (rarely dioecious); **female flowers:** stigma and style 1 (rarely 3), persistent, filiform, (1.4) 1.7–2.6 (3.3) mm long, recurved and often appressed in fruit; **ovary** 1, minute, compressed; **fruit** a bursiform achene, laterally compressed, stipitate, ca. 3 mm long and 1.5 mm broad, green with rusty spots at first, brown at maturity; **perianth** minute, of two unequal pairs of free lobes; **inner perianth lobes** green with wrinkled, hyaline margins, ovate to obovate-falcate, or spatulate, accrescent in fruit, up to 2 mm long, 1 mm broad, laterally appressed to the achene, glabrous or sparsely puberulent or with ciliate margins; **outer perianth lobes** acute-deltoid, minute, greenish to pink or hyaline, puberulent; **stipe** elongating to become a **carpophore** up to 1 mm long and often reflexed in fruit; **pedicel** developing 2 green wings, broader toward the apex, forming auriculate lobes, often exceeding the jointed pedicel tip, lobe margins slightly irregular and hyaline (appearing much like the inner perianth lobes); **female inflorescences** in the axils of upper leaves, cyme-like panicles 2–10 (18) cm broad, with up to hundreds of flowers, lax, spreading up to 35 cm broad in fruit, the axes puberulent to hispid and usually bristling with stinging hairs; **stinging hairs** 1–2 mm long, pale and stiff, the tip with an offset mucro which breaks easily on contact, opening the hollow injecting-tip, the base a swollen, keg-like chamber filled with fluid; **male flower:** **stamens** (4) 5; **filaments** short, **anther sacs** globose; **perianth** of (4) 5 lobes (sepals), somewhat united below, the lobes greenish-yellow with hyaline margins, cucullate with a central abaxial crest, some with a few hispid hairs, their **pedicels** up to 1.5 mm long, jointed at the flower base; **male inflorescences** axillary panicles borne below the females, slender, much branched with up to hundreds of tiny flowers, axes puberulent, varying in the density of stinging hairs, but almost always with a few; **leaves** alternate, ovate, 5–20 (26) cm long, 4–15 (18) cm broad, with obtuse to truncate or cordate bases (or lamina intersecting its more rounded base at oblique angles) and acute to acuminate or cuspidate tips, margins coarsely dentate to serrate, upper surface dark green, smooth to muricate, glabrescent, sometimes with a few stinging hairs along the major veins, minute, whitish cystoliths when dried, lower surface paler, glabrous to puberulent along veins, often with stinging hairs on the midrib and major veins; **petioles** 2–12 (16) cm long, sometimes equaling the leaves, somewhat translucent; **stipules** lanceolate or often bifid, ca. 2 mm long, fugacious, the withered remains often clinging to the straight scars lateral to the petiole; **stem** terete to canaliculate, bright green to fleshy-translucent, 1–2 (2.5) meters tall from a tuberous **root system**, with fibrous laterals.

Importance: Wood-nettle is best known for the searing pain that can be inflicted on skin contact with its stinging hairs. This is the result of both mechanical irritation and a chemical reaction that is slightly delayed, allowing many a novice to wade deeply into a nettle colony before realizing the gravity of the situation. The skin irritation, much like a rash or burn, is called irritant dermatitis, and is caused mostly by histamine-like substances contained in the swollen bases of the stinging hairs. Wilted specimens lose their stinging ability quickly, due to lack of turgor in the specialized, hypodermic-like cells. There are reports of *Laportea* being boiled as a pot herb; its extract is also suspected to be diuretic.

3. PARIETARIA

Common Name: Pellitory

Authority: Linnaeus, Species Pl. II, p. 1052, 1753

A genus of about 20 species worldwide, occurring mostly in temperate and subtropical areas with few tropical species. One native species, *P. pensylvanica* Muhl. ex Willd., ranges into New York State, and *P. judaica* L., pellitory-of-the-wall, has been reported as a rare escape. The latter species is of some importance in folk medicine in Europe.

1. *Parietaria pensylvanica* Muhl. ex Willd.

Common Names: Pellitory, Hammerwort

Type Description: Muhlenberg in Willdenow, Species Pl. IV, p. 955, 1806

Synonyms: *P. obtusa* Rydb. ex Small, *P. pensylvanica* var. *obtusa* (Rydb. ex Small) Shinnars

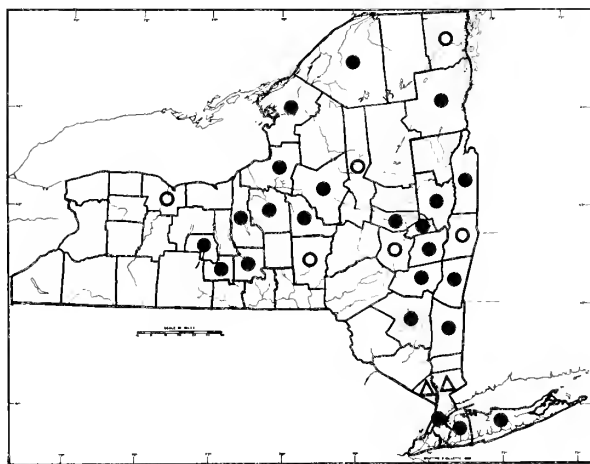
Origin: Eastern North America

Habitats: Moist cliffs, drip-ledges, often on limestone, shale ledges and sandy woods, or occasionally in waste places and urban habitats

Habit: A laxly ascending to erect, slender annual

Flowering: May–July

Fruiting: May–October



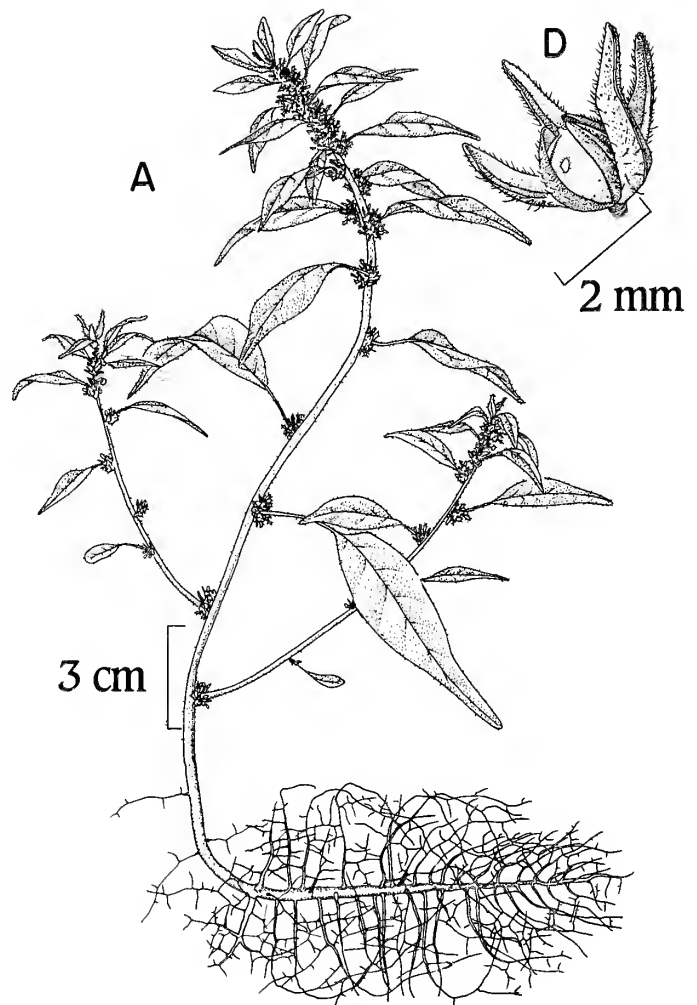
General Distribution: Maine and southwestern Quebec west to British Columbia, south to Nevada, Mexico and Florida

Description: Plants **polygamo-monoecious**; **female flowers:** **stigma** 1, crested with a few deciduous, setose hairs; **style** capitate, persisting as a minute nipple in fruit; **ovary** 1, superior, ovoid, ca. 0.4 mm long, glossy and pale; **fruit:** an achene, lenticular with a minute ridge traversing the broad margin, only slightly compressed, 0.9–1.3 mm long, 0.8–1.0 mm wide, the surface lustrous, reflecting white from the minutely beaded inner layer of the exocarp, somewhat translucent, tan to golden brown with age, the darker **seed** faintly visible within; **perianth** of a single series of 4 lobes (**sepals**), strongly veined and united at base, 1.0–1.6 mm long, lance-ovate with acute tips, greenish, turning golden brown, densely (to sparsely) pilose, at least partially enclosing the achene; **bisexual flowers:** the first flower to appear in a cluster often bears **stamens**, otherwise it is much like the females; **filaments** short, arched, somewhat fleshy, **anther sacs** globose to flattened; **pedicels** minute, flowers subsessile, each subtended by 2–5 linear-lanceolate **bracts** 1.6–3.4 mm long at maturity, usually surpassing the fruiting calyces by 2–3 times their length, abaxial surfaces and margins with sticky, hispid, hooked and glandular hairs; **inflorescences** axillary, glomerate clusters of (2) 3–7 (11) flowers; **leaves** alternate (sub-opposite in seedlings), oblong-lanceolate, sometimes inequilateral and falcate, 1–8 (10) cm long, 0.4–1.5 (2.3) cm broad, with acute (or blunted) tips and cuneate to obtuse bases, margins entire, surfaces hispid-pilose to glabrescent, the upper showing white punctations (cystoliths) when dried; **petioles** mostly 4–20 mm long, short-scabrous to pilose; **stipules** absent; **stems** unbranched or with a few branches near the base, ascending, often lax, more or less grooved below, puberulent to pilose, mostly 5–25 cm tall from a thread-like taproot or branched annual root system. ($2n = 16$)

Infraspecific Variation: *Parietaria pensylvanica* differs from the more southern *P. floridana* Nutt. in having longer, narrower leaves and longer inflorescence bracts. Depauperate individuals are occasionally responsible for mistaken reports of *P. floridana* from our area.

Importance: Pollen of this species is listed as an aeroallergen.

Waif: *Parietaria judaica* L. is a rare and apparently non-persistent escape from cultivation in New York State. In Europe the extract is gargled for toothache and taken internally as a laxative, diuretic and panacea for urinary tract ailments.



4. URTICA

Common Names: Nettle, Stinging-nettle

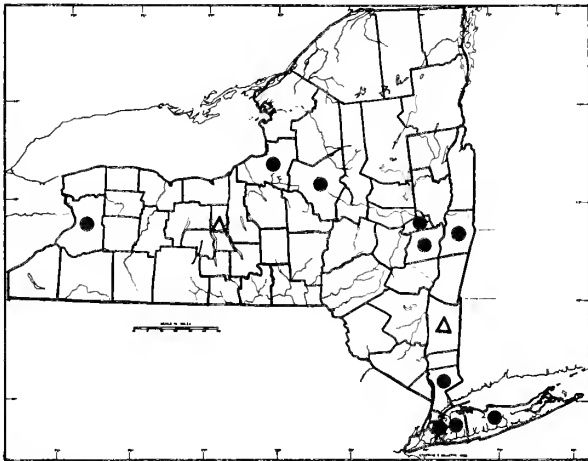
Authority: Linnaeus, Species Pl. II, p. 983, 1753

A genus of 40 or more species of temperate and montane climates in both hemispheres. *Urtica dioica* L. is a circumboreal perennial, represented here by two subspecies, one native, the other introduced from Eurasia. *Urtica urens* L. is an uncommon, annual weed from Europe. Best-known for stinging hairs, plants of this genus have also been used as food. In the 19th Century, and in later times of war, their bast fiber was used in textile and paper manufacture.

Description: Plants **monoecious** or **dioecious** (rarely polygamous); **female flowers:** stigma tufted-capitate; style more or less obsolete; **ovary** 1, superior, compressed; **ovule** 1, orthotropous; **fruit** a lenticular achene bearing a single seed; **embryo** straight with emarginate cotyledons; **endosperm** fleshy; **perianth** of 4 free sepals in 2 subequal pairs united at base, the inner pair accrescent, shallowly cucullate, attaining the dimensions of the achene and closely covering it, sometimes bearing stinging hairs, the outer sepal pair remaining small, borne on the lower margins of the achene; **male flowers:** **stamens** 4 (5); **filaments** stout to filamentous, more or less united at base around vestigial ovary tissue; **anther sacs** explosively dehiscent; **perianth** saccate-valvate in bud, of 4 cucullate sepals united below; **pedicels** longer on male flowers; **inflorescences** axillary, cymose-paniculate, bearing **bracts** and often bristling with stinging hairs; **leaves** simple, rarely incised, opposite, dentate or serrate, with cystoliths, often with stiff, stinging hairs with jointed, swollen bases, especially on the **petioles**; **stipules**, in pairs at the petiole bases, lanceolate; **stems** usually grooved, fibrous, often with stinging hairs, sprawling to stiffly erect from a **rhizome** or **taproot**, annual or perennial from a fibrous **root system**.

KEY TO SPECIES OF URTICA

1. Mature leaves mostly less than 5 cm long with sharp, often lanceolate teeth, doubly or singly serrate; fruit about 2 mm long; male flowers infrequent, borne in the same clusters with the females; plants annual 1. *U. urens*
1. Mature leaves 5–15 cm long or more, bluntly dentate to sharply (singly) serrate with triangular to falcate teeth; fruit about 1 mm long; flowers of the upper inflorescences all female (or all male); plants perennial 2. *U. dioica*



1. *Urtica urens* L.

Common Names: Burning Nettle, Dog-nettle

Type Description: Linnaeus, Species Pl. II, p. 984, 1753

Origin: Southern Europe

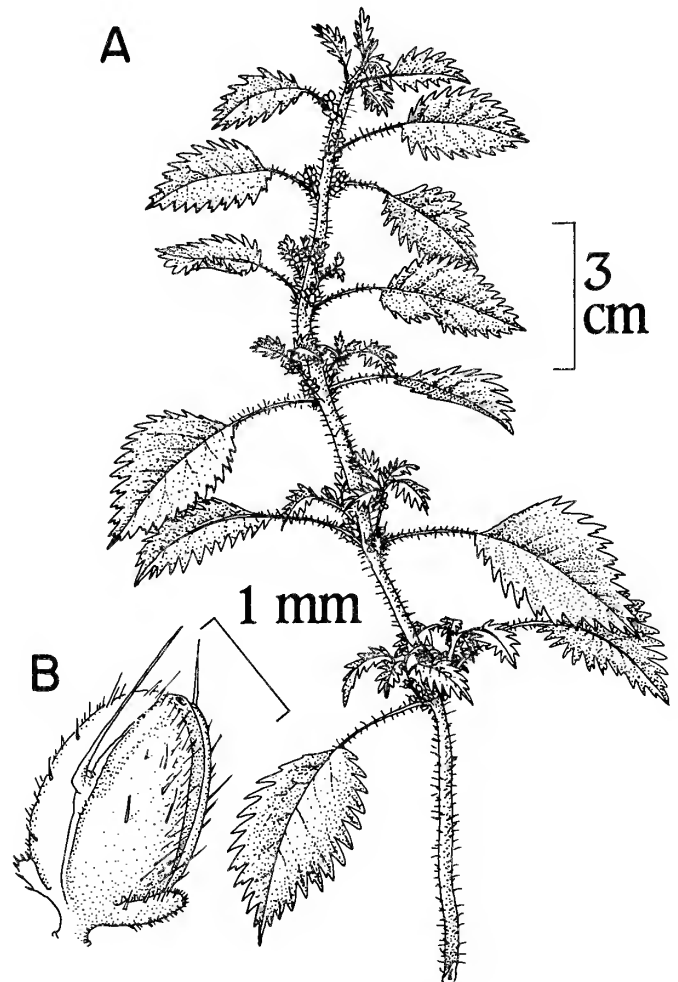
Habitats: Waste places and fields as an introduction

Habit: Sprawling, decumbent or tall-ascending, annual herb

Flowering: May–July

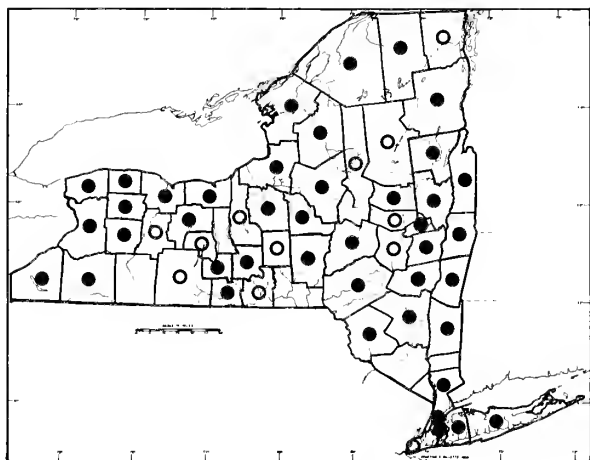
Fruiting: May–September

General Distribution: A native of Europe with scattered occurrences as a weed across North America



Description: Plants monoecious; **female flowers:** stigma tufted, capitate; **style** rudimentary; **ovary** compressed; **fruit** an achene, oval, lenticular, 1.9–2.3 mm long, 1.3–1.8 mm broad, surface tan, minutely punctate, covered by the inner sepals; **perianth** of 4 lobes (sepals), in 2 pairs, slightly fused at their bases, subequal in flower, the inner pair accrescent, attaining the dimensions of the achene and closely covering it in fruit, greenish, muricate, with scabrous hairs near the margins, often with 1 or 2 stiff, stinging hairs, one borne from the midvein; outer sepals enlarging very little, greenish, cucullate, ca. 0.4 mm long; **male flowers:** **stamens** 4, ca. 1.5 mm long; **filaments** slender **anther sacs** globose; **perianth** of 4 lobes (sepals), united at base, ovate-cucullate, creamy-greenish to translucent, ca. 1 mm long, 0.8 mm broad, with a few scabrous hairs; **pedicels** of female flowers less than 1 mm long, those of male flowers slender, pubescent, up to 2 mm long; **inflorescences** usually 2 in each leaf axil, paniculate, 0.5–2.1 cm long (often shorter than the associated petiole), bearing mostly female flowers with a few male flowers intermixed; **leaves** ovate, 1–4 (6) cm long, 0.6–2.5 (3.5) cm broad with obtuse to acuminate tips and cuneate (to cordate) bases, margins sharply singly or doubly serrate with lanceolate (to triangular-falcate) teeth, often twice as long as broad, upper surface bright green, muricate with cystoliths when dry, often densely covered with stinging hairs and some scabrous hairs, lower surface paler, stinging hairs dense to sparse and only with scabrous hairs on the veins; **petioles** (0.5) 1.5–2.5 (3.1) cm long, slender, grooved, with scabrous and stinging hairs; **stipules** in two pairs at the nodes, greenish, lanceolate, up to 1.2 cm long, 0.3 cm broad with ciliate margins; **stems** greenish to brown, grooved, scabrous and often densely covered with stinging hairs up to 1 mm long; small, lateral branches with dwarf leaves may be produced at the nodes; plants sprawling-decumbent to 1.5 meters or ascending to 1 meter from an annual root system. (2n = 24, 26, 52)

Importance: Although this is a relatively rare weed in New York State, it can be a nuisance when encountered due to its prolific stinging hairs which may cause both mechanical and chemical damage to the skin (irritant-dermatitis). The pollen is listed as an aeroallergen.



2. *Urtica dioica* L.

Common Names: Stinging Nettle, Slender or Tall Nettle

Type Description: Linnaeus, Species Pl. II, p. 984, 1753

Synonyms: Listed under subspecies

Origin: Native to both North America and Eurasia

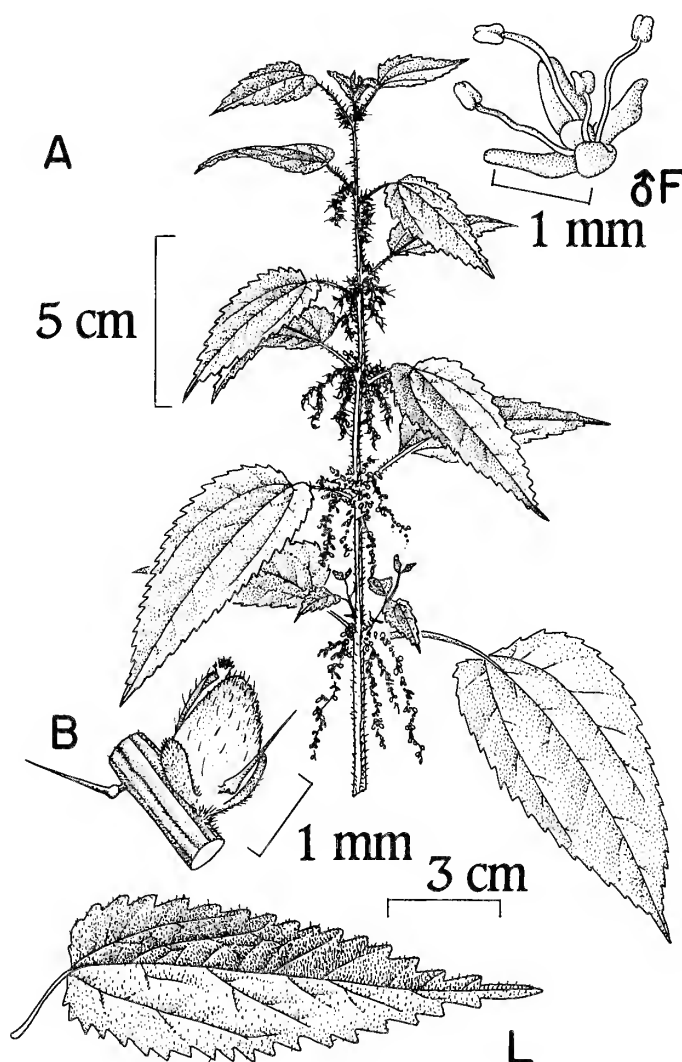
Habitats: Thickets, wet woodlands, borders, shores and clearings, usually in moist soil (also roadsides and waste places)

Habit: Slender, erect, ascending (or sprawling) perennial herbs, often forming colonies

Flowering: June–October

Fruiting: June–November

General Distribution: Labrador to Alaska, south to Virginia and southern Arizona (with a western, polyploid race ranging from Alaska to the California coast); also in Eurasia



Description: Plants **monoecious** or **dioecious** (rarely polygamous); **female flowers:** stigma tufted-capitate; style rudimentary; **ovary** 1, compressed; **fruit** an achene, 0.9–1.5 mm long, 0.6–0.9 (1.1) mm broad, ovate-lenticular, smooth, yellow-green to tan, covered by the inner sepals; **perianth** of 4 minute subequal, greenish lobes (**sepals**), ovate-cucullate, abaxially scabrescent, slightly fused at their bases, the inner pair accrescent in fruit, attaining the dimensions of the achene and investing it closely, the outer pair scarcely enlarged in fruit (ca. 0.3 mm long); 1 or more **stinging hairs** borne from the perianth bases, often from the juncture between the outer and inner sepals; **pedicels** absent or very short, bearing stinging hairs when present, or slightly winged; **male flowers:** ovary tissue a minute, sterile cap; **stamens** 4 or 5, 0.9–1.6 mm long; **filaments** slender, but somewhat flared and fused at the bases, **anther sacs**, creamy, ovoid; **perianth** valvate in bud with 4 lobes (**sepals**) ca. 1 mm long, cucullate, creamy-greenish or red-tinged, scabrescent, fused at their bases; **pedicels** slender, not armed, 0.5–1.5 mm long; **inflorescences** clustered in leaf axils, paniculate to spike-like, bearing up to a hundred flowers or more; **female inflorescences** borne mostly in upper axils of monoecious plants, their scabrous to puberulent axes and flowers often bristling with stinging hairs as well as scabrous to hispid; **male inflorescences** usually borne below the female, scabrous to hispid, but often lacking stinging hairs (or with very few); **mixed inflorescences** in the transition zone may bear male flowers below the female on the same branch or on separate branches; **bracts** rare and small in female inflorescences, commoner in males subtending the flowers, often persistent, 1–2 mm long, ca. 1 mm broad, oval to strap-like, entire or lacerate, scabrous, greenish to hyaline; **leaves** opposite, 2–15 (21) cm long, 0.8–8.0 (10.5) cm broad, broadly ovate to lanceolate with subcordate to truncate (or cuneate) bases and acute to cuspidate tips, margins coarsely dentate to falcate-serrate, upper surface darker green with cystoliths visible (on drying), glabrescent to puberulent or minutely hispid (or with stinging hairs), lower surface paler, glabrescent to scabrous, hispid (or woolly), stinging hairs lacking or few to many, especially on the prominent 3–7 veins branching and arching from near the blade base; **petioles** 1–7 (12) cm long, grooved, often hispid and with stinging hairs; **stipules** paired, lanceolate 5–9 mm long, ca. 1 mm broad, hispidulous, greenish to tan; **stems** fibrous, grooved, pale green to dark reddish-brown and yellow, glabrous to densely hispid, often with stinging hairs, especially toward the apex, unbranched or branching, up to 2 meters tall from a **rhizome** system and fibrous **root system**. (2n = 26, 52)

Infraspecific Variation: This species is a member of a circumglobal and extremely variable polyploid complex (see Woodland, 1982). Since the introduction of Eurasian plants into North America, identification of these taxa has become more difficult.

KEY TO SUBSPECIES

1. Upper leaf surfaces with a number of scattered stinging hairs; plants dioecious, sprawling. . . .2a. *U. dioica* ssp. *dioica*
1. Upper leaf surfaces without stinging hairs (or rarely 1 or 2); plants monoecious, the female flower clusters borne above the males; plants erect2b. *U. dioica* ssp. *gracilis*

2a. *Urtica dioica* L. ssp. *dioica*

Common Name: European Stinging-nettle

Synonyms: *U. gracilis* var. *latifolia* Farw., *U. pubescens* Ledeb.

Habitats: Roadsides, waste places, open fields and shores as an introduced weed

Habit: Lax, sprawling to ascending perennials, forming colonies

Note: Plants with 3–5 stinging hairs per upper leaf surface may not be assignable to either subspecies if the disposition of the sexes is ambiguous or unknown. In addition to being dioecious, these plants are polyploid (2n = 48, 52).

2b. *Urtica dioica* ssp. *gracilis* (Ait.) Selander

Common Names: Slender or Tall Stinging-nettle

Synonyms: *U. dioica* var. *gracilis* (Ait.) Taylor & McBride, *U. dioica* var. *procera* (Muhl. ex Willd.) Wedd., *U. gracilis* Ait., *U. lyallii* S. Wats. of New York reports, *U. procera* Muhl. ex Willd. (and other combinations applicable only to the western, polyploid race)

Habitats: Wet ground in a variety of habitats from full sun to deep shade

Habit: Erect or strongly ascending perennials, forming colonies

Variation: Members of this subspecies are the most variable and widely distributed nettles on the North American continent. Pubescence may be nearly lacking, as in European *U. dioica* var. *sondenii* Simm, or plants may be quite hispid, pilose or villous. Although the most widely distributed race is diploid ($2n = 26$), a polyploid western race also occurs ($2n = 52$). These plants, long known as *U. lyallii* S. Wats., may be closely related to polyploid *U. platyphylla* Wedd. of eastern Asia. To complicate matters further, there is a native, western diploid, the hoary nettle, *U. dioica* var. *holosericea* (Nutt.) Thorne. Our most pilose plants key to this subspecies, and these plants would probably be assigned there if occurring in the west.

Importance: Stinging hairs of *Urtica* species may cause distress to the skin through both mechanical abrasion and injection of chemical irritants. The nature of the irritating chemicals and of the processes resulting in dermatitis have been explained (and later disputed) in a number of articles and books. The consensus seems to be that "histamine-like" substances are injected, and that an "allergic-type" reaction ensues. The folk treatment for nettle sting is the juice of dock species (*Rumex*), which sometimes may be found growing nearby. Rosemary and marjoram are also said to give relief. Extract of nettle has long been used as a hair rinse in scalp-treatment products and (ironically) as a homeopathic treatment for skin irritations. Taken internally, nettle extract is reputed to be a diuretic. In Europe the nettle is often eaten, boiled as a pot herb when young, baked into puddings, and brewed into a beer. The pollen of *Urtica dioica* is listed as an aeroallergen. Bast fibers of nettles have been of minor importance in cloth and paper production, particularly in Europe. Extensive use was made of nettle fiber in Germany during both World Wars, when it was combined with ramie, cotton and other fibers in a number of fabrics, whose uses ranged from bedsheets to uniforms and airplane coverings.

Waif: *Urtica chamaedryoides* Pursh, the weak-nettle of the southeastern states, was found once as an annual waif near Rochester (Monroe Co.).

5. PILEA

Common Names: Richweed, Clearweed, Coolwort

Authority: Lindley, Coll. Bot., *ad pl.* 4, 1821

A genus of several hundred species (over 600 named), mostly of pan-tropical distribution. Several tropical species are grown as houseplants, including the well-known aluminum plant, *P. cadieri* Gagn. & Guill.

Description: Plants **monoecious** (or dioecious); **female flower:** stigma tufted, mostly deciduous in fruit; **style** rudimentary; **ovary** 1, superior; **ovule** 1, orthotropous; **fruit** an achene; **seed** 1; **embryo** with ovate cotyledons in a fleshy **endosperm**; **staminodes** 3, opposite the perianth lobes, flexing in at maturity to eject fruit; **perianth** of 3 lobes (**sepals**), somewhat fused at base, either radially symmetrical with three similar lobes or bilateral with one lobe strongly hooded; **male flowers:** **ovary** rudimentary; **stamens** (3) 4; **perianth** valvate in bud with (3) 4 often cucullate **sepals** minutely crested abaxially **pedicels** usually longer in male flowers; **inflorescences** axillary, branched, cymose or paniculate, male and female flowers often borne on different inflorescence branches at the same node; **bracts** present; **leaves** usually opposite, one leaf of the pair may be much-reduced, the blades may be variegated or translucent, often with prominent cystoliths, a few with minute stinging hairs; **petioles** usually present, variable in length; **stipules** present, caducous or persistent; **stems** often semi-succulent and translucent, erect to sprawling or scandent, annual or perennial from a **taproots** or fibrous **root systems**.

KEY TO SPECIES OF PILEA

1. Achene dark, emerald green to purple or almost black, with distinct, pale to colorless margins, the surface often with warty tubercles; achene over 70% as wide as long; sepals often equaling the achene in length 1. *P. fontana*
1. Achene yellow-green to tan with slightly raised, irregular, maroon to purple-brown markings, the margins not distinctly paler than the surfaces; warty tubercles lacking; achene rarely over 50% as wide as long; sepals usually shorter than the achene 2. *P. pumila*

1. *Pilea fontana* (Lunell) Rydb.

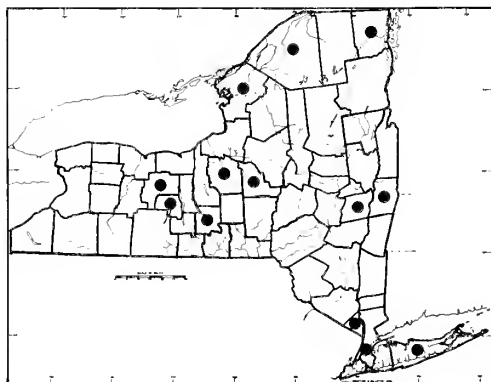
Common Names: Clearweed, Coolwort

Type Description: Lunell, Amer. Midl. Nat. 3: 7, 1913

Synonyms: *Adicea fontana* Lunell, *A. opaca* Lunell, *Pilea opaca* (Lunell) Rydb.

Origin: Eastern North America

Habitats: Muck of swamps, fens, bogs and shores, often in open areas, where it forms colonies



Habit: Erect or ascending, often slender annuals

Flowering: (July) August

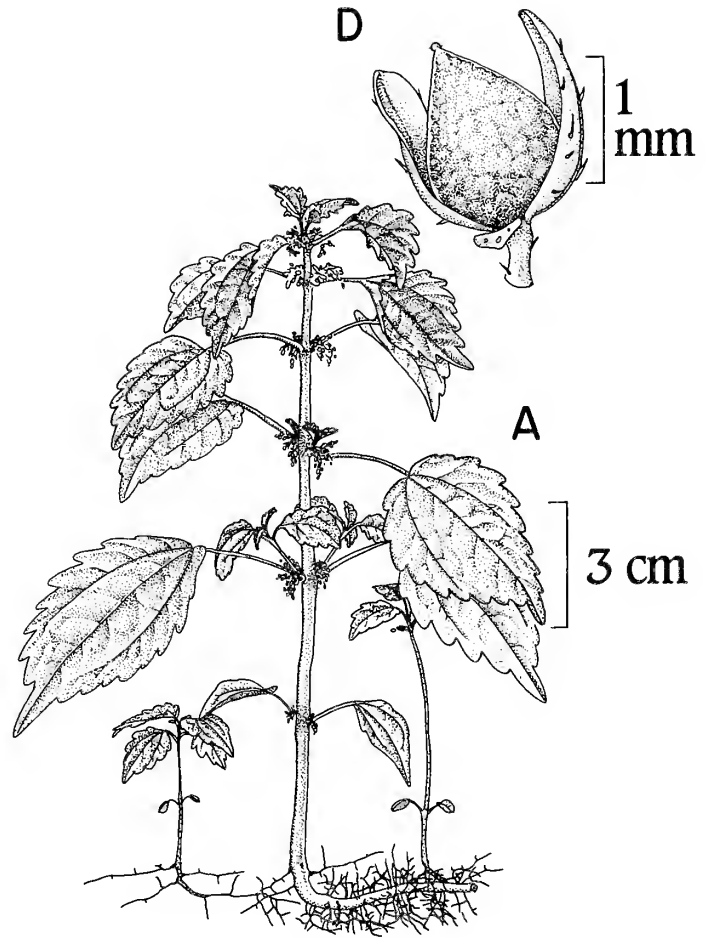
Fruiting: August–September

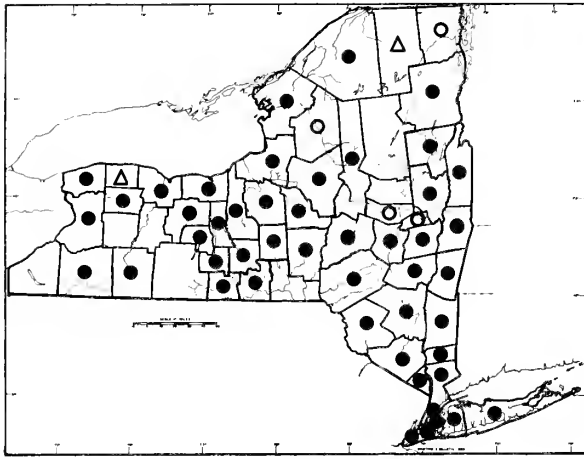
General Distribution: Prince Edward Island to North Dakota and Nebraska south to northeastern Florida (sporadic)

Rarity Status: This species is easily overlooked, since fruiting plants may be dwarf, simulating dense seedling-growth of the commoner species. It is currently known from only seven locations in the State and it is ranked T-3 (threatened, low protection priority). It has New York State Heritage Program ratings of Global-5, State-3.

Description: Plants **monoecious**; **female flowers:** stigma tufted; **style** capitate, persistent as a tiny knob; **ovary** 1, smooth, lenticular; **fruit** an achene, 1.3–1.8 mm long, 1.0–1.5 mm broad, usually over $\frac{3}{4}$ as broad as long, lenticular, the surface dark olive-green to almost black (or purplish), often showing the outline of the tubercles (bosses) of the seed when dried, achene margins distinct, sharp and pale greenish to white or even hyaline, with a follicle-like tendency to dehisce at maturity; **seed** 1, glossy golden brown, tuberculate, attenuate toward the apex, loosely invested in the shiny, purple to black endocarp; **staminodes** 3, opposite the perianth lobes, tongue-like, ca. 0.5 mm long; **perianth** of 3 similar, cucullate, pale-creamy lobes (**sepals**) ca. 0.6 mm long, 1.4–2.1 mm long in fruit, often equaling or exceeding the achene, linear-lanceolate, canaliculate, involute at tips, broader and fused at bases, each lobe with a strong central vein; **male flowers:** **stamens** 4; **filaments** fleshy, short, **anther sacs** creamy, **perianth** of 4 greenish to creamy **sepals** somewhat fused at base with an occasional cystolith or hair on the abaxial surfaces; **pedicels** mostly 1 mm or less, fleshy-translucent; **inflorescences** branched, cymose-paniculate to glomerulose, densely clustered in the leaf axils, bearing both male and female flowers on different axes; **leaves** opposite, rhombic-ovate, 0.4–7.5 cm long, 0.3–5.5 cm broad with acute to blunted-cuspidate tips and cuneate to obtuse bases, margins coarsely blunt-toothed (to subentire) upper surface darker, glossy green with prominent linear cystoliths (when dry) and an occasional erect (mildly irritating, sometimes stinging) hair with a swollen base, lower surface paler with a few such hairs, especially on the veins, or glabrous; **petioles** slender, 0.2–2.5 (3.5) cm long, often less than $\frac{1}{3}$ the leaf length in small plants, their surfaces with linear cystoliths; **stems** more or less translucent green, covered with linear cystoliths, unbranched (or branched from the lower nodes), 2–25 (45) cm tall, erect or ascending from a creeping base and fibrous annual **root system**.

Infraspecific Variation: Petiole length has been used by Fernald (1950) and others as a primary key character, but this is inadvisable. Though the tiny seedling-like plants most often collected in New York and New England have short petioles (relative to leaf length), some specimens are more typically midwestern, with much larger leaves and longer petioles. These plants may also branch, whereas *P. fontana* is often said not to do so. Fruit characters alone distinguish this species from the more common *P. pumila*, and some authors lump the two taxa. Although fruit distinctions are usually very clear, two (of the several hundred) specimens seen during this study had achenes that were generally pale throughout, with purplish mottling beneath the surface, some reddish spotting and a few warts. This combination of characters was found only on relatively immature (possibly sterile) fruits, and may be an artifact.





2. *Pilea pumila* (L.) Gray

Common Names: Richweed, Clearweed, Coolwort, Coolweed

Type Description: Linnaeus, Species Pl. II, p. 984, 1753

Synonyms: *Adicea pumila* (L.) Raf. (*Adike*), *Pilea deamii* Lunell, *P. pumila* var. *deamii* (Lunell) Fern., *Urtica pumila* L.

Origin: Eastern North America

Habitats: Moist forest and swampland, lake borders, stream courses and ledges, usually in shade

Habit: An erect or ascending annuals

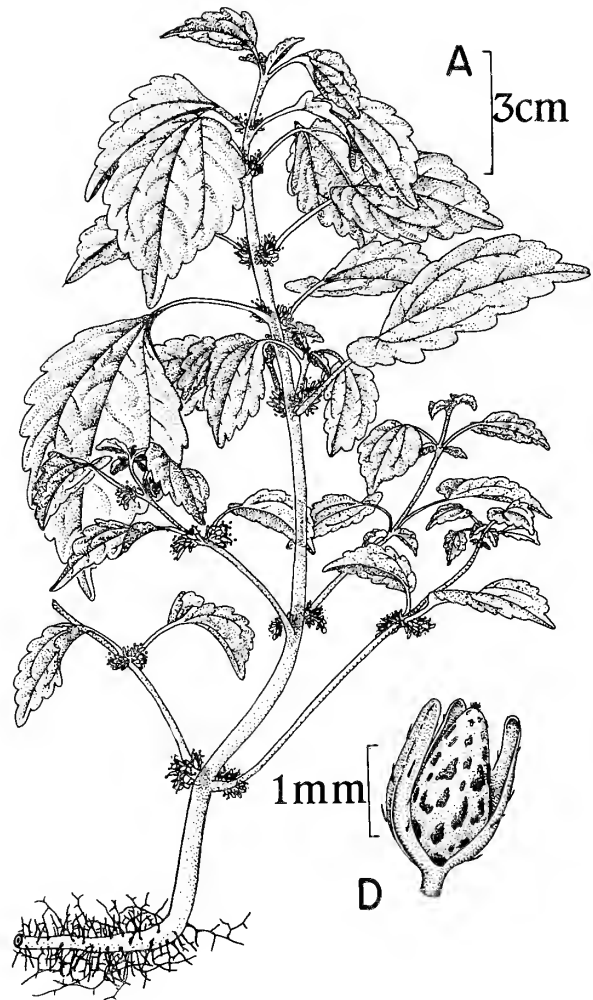
Flowering: July–September

Fruiting: July–November

General Distribution: Prince Edward Island. to South Dakota and Kansas, south to eastern Texas and Florida

Description: Plants **monoecious** (or polygamous); **female flowers:** stigma tufted; style capitate, minute; ovary lenticular; **fruit** an achene, 0.9–2.0 mm long, 0.6–1.1 mm broad, usually $\frac{1}{2}$ to $\frac{2}{3}$ as broad as long, lenticular-oblong, the tip tapered but blunt, the surfaces pale green to tan, not tubercled, but usually with irregular, slightly raised color patches of reddish to purple-brown, margins dull or sharp, colored much like the surfaces and not conspicuously paler; **seed** 1, smooth, ovate, golden-brown, invested loosely to tightly within the pale endocarp; **staminodes** 3, tongue-like, ca. 0.5 mm long, borne opposite and cupped within the sepals until they forcibly eject the fruit, then curl inward; **perianth** of 3 cucullate lobes (sepals) ca. 0.4 mm long, white with greenish or rose-tinged margins, 0.6–1.5 mm long in fruit, not equaling the mature achene, somewhat flared and slightly fused at bases, greenish with almost translucent margins, canaliculate, trough-like with cucullate tips, each with a strong midrib; **male flowers:** **stamens** 4; **filaments** ca. 0.5 mm long, **anther sacs** oval, white; **perianth** of 4 minute, reddish sepals, valvate in bud, separating into cucullate lobes, each with an elongate, green process borne abaxially, projecting beyond the acuminate tip; **pedicels** 0.2–1.2 mm long (female flowers), up to 2 mm long (males); **inflorescences** branched, axillary, cymose-paniculate or dense, clusters with few to dozens of flowers, the male and female (occasionally perfect) flowers borne on different branches at the same node; **bracts** uncommon, but much like the sepals when present; **leaves** opposite, 2–7 (11) cm long, 1–5 (9) cm broad, ovate to rhombic with acute to blunted-cuspidate tips and cuneate (to rounded) bases, margins with blunt, rounded to relatively sharp, coarse teeth, each usually with a tiny apiculation (or young leaves may be entire), upper surface darker green, with linear cystolyths apparent on drying and a few very short, erect (mildly stinging) hairs with swollen bases, lower surfaces with a few such hairs, especially on the veins of young leaves, becoming glabrous; **petioles** slender, translucent, unarmed, canaliculate above, 1–7 (10) cm long; **stems** terete or grooved, glabrous except for a few hairs at the nodes, translucent emerald green, up to a meter tall, but usually much less, from a short, more or less creeping base with fibrous, annual **roots**. (2n = 16)

Infraspecific Variation: Although some plants occurring in New York State have rounded leaf bases and sharp marginal teeth, this combination of characteristics is usually associated with more southern and midwestern plants. The name *P. pumila* var. *deamii* (Lunell) Fern. was once applied to such plants, until it was realized that the variation pattern is roughly clinal.



Juglandaceae (Walnut Family)

The Juglandaceae: a family of 7 (8) genera and about 50 species, distributed mostly in the temperate Northern Hemisphere, but with a few representatives in South America and on Pacific Islands. *Carya* (Hickory) and *Juglans* (Walnut), are represented in eastern North America and eastern Asia; species of both genera are important economically for their nuts and durable woods. Their woods are especially valuable in cabinet and furniture making, as are those of the related genera, *Engelhardtia* and *Pterocarya*. Their bark is a source of dyes and tannins, and the nuts are edible, providing a food source for wildlife. Hickories, Walnuts and their relatives are also widely grown as street and yard trees.

FAMILY DESCRIPTION

Trees (rarely shrubs) with alternate (rarely opposite), deciduous, pinnately compound or trifoliolate leaves. Aromatic glands and scales and glandular and non-glandular hairs are commonly present. Stipules are lacking. Plants are monoecious (rarely dioecious) with the small staminate flowers in lateral, pendulous catkins; female flowers are borne singly or in few-flowered, erect, terminal inflorescences in our representatives (they are variously disposed in genera not native to eastern North America). Flowers of the male catkins usually borne in the axils of 2 bracts (or bracts fused or obsolete), the perianth (if present) of 1–5 (often 4) lobes. Stamens range from a few to over 100 per flower in different genera, with short filaments and anther sacs dehiscing by longitudinal slits. There is sometimes vestigial ovary tissue in the male flowers. Female flowers have 4 tooth-like sepals (or sepals obsolete) and an inferior ovary of 2–3 (4) carpels, unilocular above with a single orthotropous ovule, 2–4 loculed below; subdivisions and partial partitions may develop in fruit giving the appearance of many locules. The ovary is surrounded by an involucre of 3–5 fused, valve-like bracts. This structure becomes the fruit husk, which may be persistent or tardily dehiscent by sutures. The fruit is a fleshy to woody or fibrous nut or drupe (or samara) with a single seed, lacking endosperm; the embryo is large and oily, with lobed cotyledons.

KEY TO GENERA

1. Staminate catkins one or more per node, but not sharing common peduncles; fruit husk pulpy-fibrous, shriveling with age; stigmas elongate, divergent; most leaves with 10 or more leaflets, the largest often borne near the middle of the leaf; pith of the twigs chambered1. *Juglans*
1. Staminate catkins borne in 3's from common peduncles; fruit husk woody; stigmas short, fleshy; most leaves with 5–9 leaflets, the terminal ones sometimes largest; pith of twigs not chambered2. *Carya*

1. JUGLANS

Common Names: Walnut, Butternut

Authority: Linnaeus, Species Pl. II, p. 997, 1753

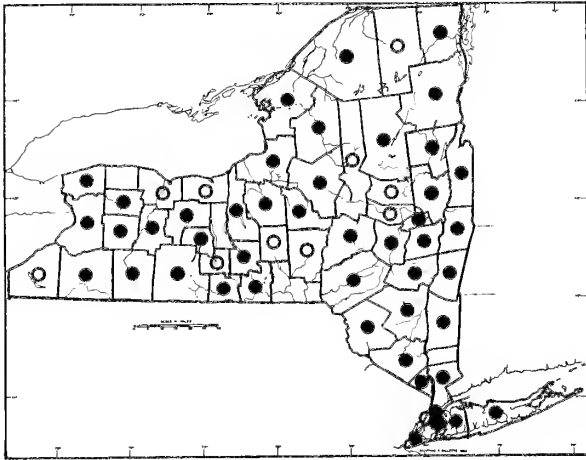
A genus of 20 or fewer species of circumpolar distribution in the Northern Hemisphere, extending to South America and southern Asia. Of the five species native to North America, two are widespread in the east: *J. cinerea* L., the butternut, and *J. nigra* L., black walnut. *Juglans regia* L. the English or Carpathian walnut is planted widely in the United States, sometimes grafted to native species, and it occasionally escapes cultivation. Walnut and butternut are popular trees in horticulture, valued for their nuts and woods. They were spread over the continent along Native American trade routes long before European settlement, and some of the so-called species may be aboriginal cultivars.

Description: Plants **monoecious**; **female flowers:** stigmas 2, elongate, plumose; **style** 1, **ovary** 1, inferior, unilocular, 2–4 partitioned below; **ovule** 1, orthotropous; **fruit** an indehiscent, 2-valved nut with a single seed and oily **embryo**; **endosperm** lacking; fruit enclosed within an indehiscent **husk** developed from the fleshy involucre; **perianth** usually of 4 **sepals** (or reduced to minute teeth), **involucre** a cup of fused bracts and bractlets, enlarging to become a fleshy to fibrous husk; **female inflorescence:** a terminal spike or cluster of few flowers; **male flowers:** **stamens** 7–40 (100 +) per flower; **filaments** short, free; **anther** sacs oblong, dehiscing longitudinally; **perianth** of 3–6 **sepals** adhering to a **primary floral bract** with 2 bractlets; **male inflorescence** a pendulous, subsessile catkin appearing in fall and elongating the following spring, borne 1 or more per node but not from a common peduncle; **leaves** alternate, pinnately compound, the leaflets glandular-aromatic, oblique, with serrate (or entire) margins, the largest **leaflets** often near the middle (the terminal leaflet may be suppressed or fused to a lateral; **petioles** terete, canaliculate and often swollen at base; **leaf scars**

conspicuous, strongly 3-lobed to cordate; **stipules** absent; **buds** usually with 2 pairs of scales, the lateral buds often superposed, somewhat compressed; **twigs** terete, stout, with chambered **pith**; **bark** furrowed, with anastomosing ridges; **crown** open, irregular to flat- or round-topped; **trunk** straight with a short to tall bole, a **taproot** in early life, and a broadly spreading **root system**.

KEY TO SPECIES OF JUGLANS

1. Pith diaphragms chocolate brown; fruit husk elliptic with an acute apex; mature leaves clammy, the upper surfaces at least moderately glandular and stellate-pubescent; most leaf scars of older twigs with a prominent, woolly brow along the upper margin just under the buds1. *J. cinerea*
1. Pith diaphragms tan to pale brown; fruit husk usually globose; mature leaves with upper surfaces smooth, glabrous to sparsely pubescent; leaf scars of older twigs without a prominent, woolly brow2. *J. nigra*



1. *Juglans cinerea* L.

Common Names: Butternut, White Walnut, Oil-nut, Lemon Walnut

Type Description: Linnaeus, Species Pl. ed. 2, p. 1415, 1763

Synonym: *Wallia cinerea* (L.) Alef.

Origin: Arctotertiary Forest (native to North America)

Habitats: Northern hardwood forest and oak-hickory associations, often on stream terraces, the trees often scattered, not forming pure stands (more limestone-tolerant than *J. nigra*)

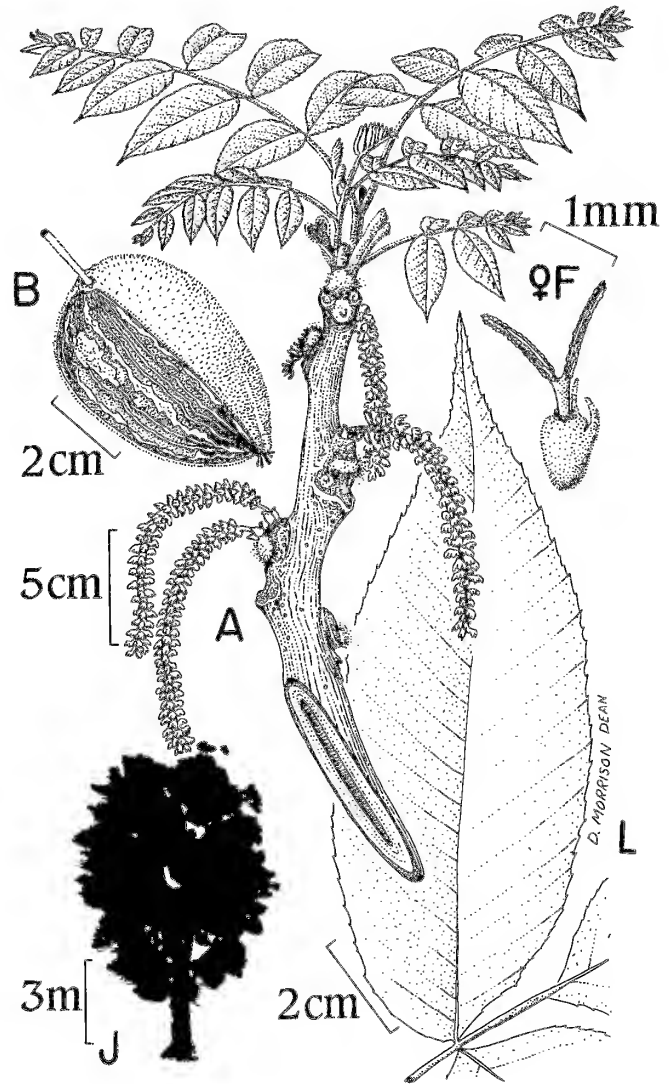
Habit: A small to medium sized tree, often with a short bole, stout lower branches and flat or round-topped crown

Flowering: (April) May–June

Fruiting: August–November

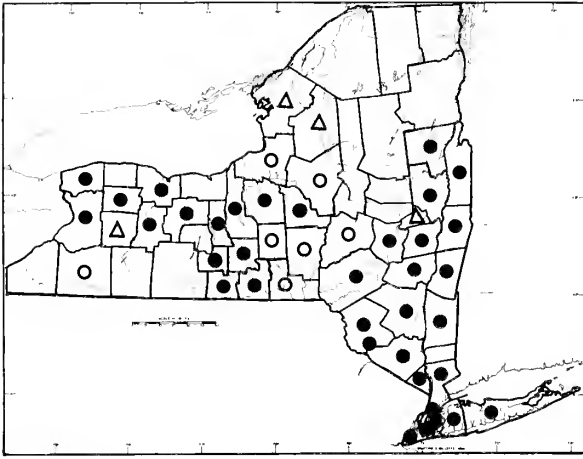
General Distribution: New Brunswick to Minnesota, south to Arkansas, central Mississippi, Alabama and north Georgia

Description: Plants **monoecious**; **female flowers:** **stigmas** (style branches) 2, free, linear to clavate, 0.7–1.4 cm long, 1–3 mm broad, fimbriate-papillose over most of their adaxial surfaces, glandular-hispidulous abaxially; **style** (base) stout, 1–2 mm long, glandular; **ovary** cylindric, 0.6–1.2 cm long, inferior; **fruit** a nut (within a husk); **nut** (only) 3.8–5.6 cm long, 2.5–3.7 cm broad, ovoid to oblong-cylindric, acute to apiculate at tip, 2-locular below, surface brown with rough,



corrugated surfaces and a single, oily seed; **perianth** of 4 triangular-acute, pubescent **sepals** arising from the ovary summit; **involucre** a fusion of 2 **bracteoles** and a bract, cylindric, tough, leathery, hispid, densely glandular and clammy on its surface, fused to the ovary except at the summit, becoming a fibrous involucreal husk in fruit; husk ovoid, with 2 relatively prominent ridges and 2 less prominent ones, acute at apex, 4.6–7.2 cm long, 2.9–4.5 cm broad, greenish until fruit drop, becoming golden, bronze and black, shrinking and wrinkling before disintegrating; **pedicels** absent; **female inflorescences** are stiff spikes of (1) 2–6 (8) flowers borne at stem apices, the axis and common peduncle (0.5) 1–11 cm long, tough, fleshy, clammy-glandular, hispid and often with stellate hairs as well, later bearing the 1 or 2 (–4) developing fruits; **male flowers: stamens** (6) 9–15 (17); **filaments** virtually obsolete; **anther sacs** sessile, elliptic, dehiscing longitudinally, often bristly at their tips; flower subsessile, the **perianth** fused to a common, stamen-bearing axis with (2) 4–6 minute, greenish, obtuse to acute **lobes** and a terminal, obtuse to acuminate **primary bract** that is densely hispid abaxially; **male inflorescences** are pendulous catkins 2–12 (14) cm long with up to dozens of subsessile, staminate flowers which shed copious pollen, the canalicate axis subtended by hispid **bracts** and **bud-scales**; **leaves** alternate, pinnately compound with (5) 7–17 (19) leaflets, borne subopposite to opposite, the terminal leaflet reduced or not, leaflets ovate to lance-falcate, 1–15 (21) cm long, 0.5–6.5 (9) cm broad with rounded to truncate or strongly inequilateral bases and (acute to) strongly attenuate tips, the margins finely and sharply serrate, upper surface darker green with glandular hairs, simple and stellate pubescence persisting into maturity, lower surface moderately to very densely stellate and glandular pubescent; **petiolules** very short or leaflets sessile; **rachis** with strongly glandular pubescence, 15–55 cm long, excluding the 5–16 cm **petiole** which is terete to canalicate, covered with glandular and nonglandular hairs, the base swollen with a pale, densely woolly zone (often deltoid) in its axil just below the first axillary bud, this zone tearing upon abscission to leave a woolly brow above the 3-lobed **leaf scar**; **lateral buds** woolly, ovoid, often with 1 larger and up to 3 smaller buds per axil, vertically aligned; **terminal buds** up to 1 cm long oblong, blunt, woolly; **twigs** with ridged and fluted **young bark**, reddish to gray-green, shedding the glandular, simple and stellate hairs, **lenticels** small, oval, pale; **pith** of woody twigs chambered, dark, chocolate brown to almost black; **mature bark** with anastomosing furrows and broad, forming flat ridges, a diamond-shaped pattern on old trunks, light to dark gray; **trunk** often with a short bole and large ascending branches that form an irregular, rounded or flat-topped **crown**; tree usually 10–20 m tall (maximum 30 m) and 30–50 cm (d.b.h.) [maximum 1 m]; producing a **taproot** (in deep soils) then with wide-spreading lateral **roots**. (2n = 32)

Importance: The nut of *J. cinerea* is edible to both humans and wildlife. Recipes from the 18th and 19th centuries describe collecting the nuts before they are ripe, burning, boiling and pickling them in various ways. The husks are usually allowed to ferment and stripped away to avoid stains they can produce. The oily meat of the nut can be used in sauces, gravies, soups and as flavoring. Though butternuts are not of great economic importance, they are often collected locally and packaged for sale, or used in the manufacture of ice cream and cookies; they may also be fine-ground and added to flower in baking. Early settlers reported that some groups of Indians used the oil as flavoring and for frying as well as for anointing their hair. The bark may be extracted for syrup and sugar, and it has been a source of emergency food since pre-settlement. The fruit husk produces a yellow to gray-brown stain that can permanently mark fabric (or skin). Husks as well as the bark of roots and stems have been extracted for dye-making. A wide variety of colors ranging from yellow-orange to rich brown (greenish, purple and black) has been obtained, using different plant parts, mordants, iron extractions and other chemical processes. A root-bark extract has been used in folk medicine as a mild cathartic, a liver medicine and for fevers. The oil of the nut has been taken for tapeworm. Wood of butternut is less hard than that of walnut and less valuable on the market; however, it has been put to many uses, especially in the furniture industry; it was once a great favorite of wood carvers for mantles, alters and ornate figures. Butternut makes an excellent veneer or paneling, and it has been widely used on drawer-fronts and other facades. The Shakers carved it into simple bowls, and frequently used it as structural wood in their furniture. It has many desirable qualities (such as planing easily and later holding its edges), and it is found more widely in furniture and cabinet building than the literature indicates.



2. *Juglans nigra* L.

Common Names: Black Walnut, Walnut

Type Description: Linnaeus, Species Pl., p. 997, 1753

Synonyms: *J. nigra* forma *oblonga* (Marsh.) Fern., *J. nigra* var. *oblonga* Marsh., *Wallia nigra* (L.) Alef.

Origin: Arctotertiary Forest (native to North America)

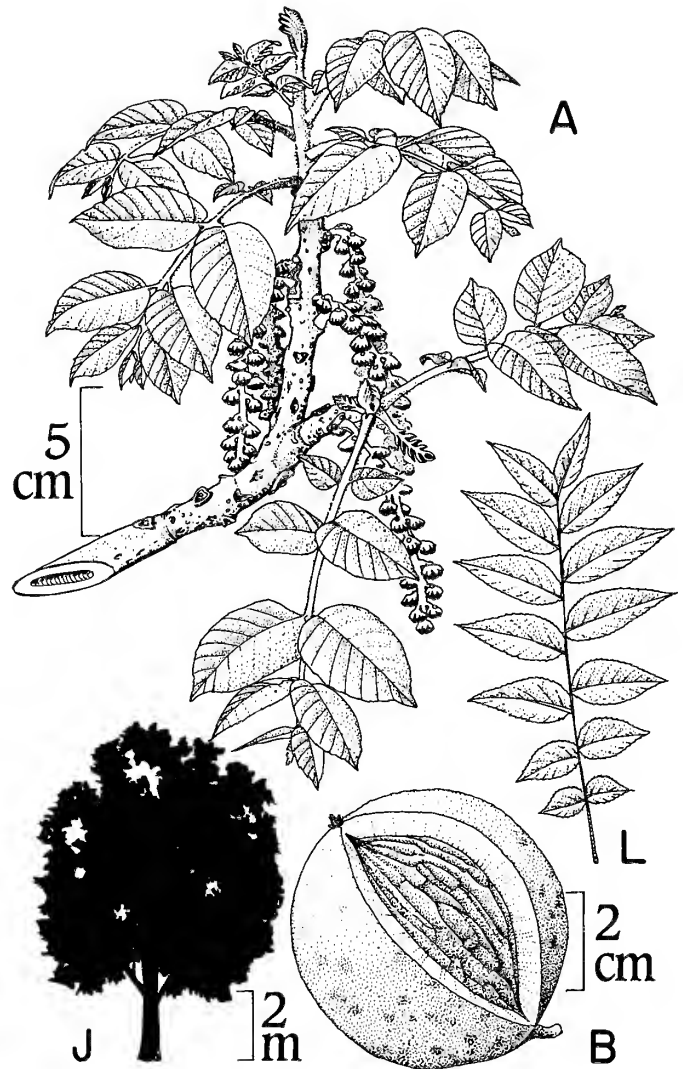
Habitats: Forest to full sunlight of clearings, in rich, deep, often alluvial soils, commonly associated with mixed-mesophytic forest species that are commoner further south; it shows little tolerance for limestone or deep shade

Habit: A medium sized tree, shade-intolerant and fast-growing when young, developing a tall bole and a small (to large and spreading), open crown that leafs out late in the spring season

Flowering: (May) June

Fruiting: September–November

General Distribution: Massachusetts and southern Ontario to South Dakota, south to central Texas and north Florida



Description: Plants **monoecious**; **female flowers**: stigmas (style branches) 2 (–4), free, linear, fimbriate-papillose on the adaxial surfaces, pale woolly to stellate abaxially, 0.7–1.2 cm long, deciduous (sometimes bearing dwarf, leafy bracts at their margins); **style** (base) short, woolly; **ovary** 0.7–1.0 cm long, inferior; **fruit** a nut (within a husk); nut (only) 2.7–4.7 cm long, 2.8–4.9 cm in diameter, subglobose or slightly broader than long, or the tip may be obtuse-apiculate, the surface dark brown to black, corrugated and furrowed with blunt ridges, containing a single, oily **seed**, 2–4 locular to above the middle with false partitions; **perianth** of 4 minute sepals fused to the involucre of coherent bracts which almost completely encloses the ovary; **involucre** ovoid, 0.8–1.3 cm long, 0.6–0.9 mm broad, pale, densely tawny-woolly, stellate and glandular-punctate, becoming a semi-fleshy (fibrous) involucre **husk** in fruit; husk 5–7 (8) cm in diameter, subglobose (rarely ellipsoid) often with some perianth and upper involucre remains at the apex, the tough surface layer yellow-green with dark punctations, turning yellow to brown, disintegrating into a sooty, black mass; **female inflorescence**: **axis** terminal to new growth, short, stout, bearing 1–4 flowers, elongating up to 1 cm, bearing 1–3 (4) fruit on short **pedicels**; **male flowers**: **stamens** (12) 15–35 (50) per flower; **filaments** obsolete; **anther** sacs sessile, elliptic, dehiscing longitudinally; **perianth** of 2–6 small, green cucullate **lobes** (variously interpreted as **sepals** or **bracts**) terminating the floral axis in an inverted cup-like structure which at first covers the stamens, reflexing at anthesis; **pedicels** 0.2–1.5 mm long, glabrous to pubescent, ridged, furrowed or fused to the base of the primary bract; **primary bracts** of the inflorescence 1 per flower, deltoid to ovate-cucullate, tufted with pale hairs abaxially, bearing the upper flowers of the catkins in their axils, but progressively fused further out on the pedicels in lower flowers, where they subtend the floral cups; **male inflorescences**: pendulous catkins 2–10 cm long, borne (singly or) clustered at nodes, but not from a common peduncle; **leaves** alternate,

pinnately compound with (9) 11–19 (23) **leaflets**, borne subopposite (opposite or alternate), the terminal leaflet frequently much-reduced in size and/or fused marginally with an adjacent one, (leaflets) ovate lanceolate to lance-falcate, often inequilateral, the larger lobe borne toward the leaf apex, (1) 3–15 (19) cm long, (0.4) 1–6 (8) cm broad, the bases obtuse to cuneate, or one lobe attenuate, subsessile, tips (obtuse) acute to strongly attenuate, margins shallowly and sharply toothed, upper surfaces darker green, pubescent when young, glabrescent to sparsely hispidulous (sparsely stellate or glandular), especially on veins, lower surfaces paler, often glandular and hispid, with fascicles of stellate hairs (especially when young) persisting along major veins; **petiolules** 0.1–1.5 mm long, glandular-pubescent; **rachises** reddish, densely glandular with tufts of tawny, stellate hairs, especially when young, 10–45 (51) cm long, excluding the similar **petioles** which are 2–8 (11) cm long and abruptly swollen at base, more or less woolly in the axil, but **not** leaving a woolly brow above the cordate **leaf scar**; **lateral buds** (1) 2 (4), aligned vertically, woolly, ovate, variable in size; **terminal buds** larger, woolly and blunt; **twigs** shedding their reddish, glandular and stellate pubescence, becoming stout, ridged and fluted, with light gray, to dark reddish-brown **young bark** and tiny, pale, oval **lenticels**; **pith** of young stems chambered, pale brown to tawny; **mature bark** of trunk gray (dark brown) to black with deep, narrow, anastomosing furrows and ragged, linear ridges; **trunk** with a tall bole and irregular, open, spreading **crown**, tree 20–30 (50) meters tall, up to 1.3 (1.8) meters (d.b.h.), from an early taproot, developing a deep, wide-spreading **root system**. (2n = 32)

Infraspecific Variation and Hybridization: Plants with elliptic-oblong fruiting husks have been called forma *oblonga* (Marsh.) Fern. Teratological fruits on some trees have been reported to simulate fruits of *J. cinerea*. Some trees do not develop the characteristic furrowing of the bark until quite large. Rarely, some leaves of a tree will have a giant, terminal leaflet, with a thumb-like lobe. A hybrid of black walnut and butternut has been reported, but, as yet, it has not been found in New York State.

Importance: Black walnut fruits are eaten by both humans and wildlife. The oily cotyledons (meats) of the nuts are highly calorie-rich. In cooking they are used in a number of gravies and puddings, and walnut meats are variously mixed with other nuts, baked into cookies, pies, cakes and other confections as well as being a favorite in or on ice cream. They are sold dried, canned or bottled in syrup. The meat of the nut is about 50% oil, which can be extracted and used in various ways. Called walnut butter, this substance has been used widely as a spread and flavoring. Green walnuts were pickled in colonial America in much the same way as butternuts. The husks, roots and bark of black walnut yielded some of the more useful dyes used in early America. Dyers preferred the husks, pounded off the nuts and dried, then boiled in pots. In some cases the iron of the pot was involved in the dye-making process. Copper or alum was added as a mordant to produce greenish to black dyes rather than the dusky-brown to yellowish hues yielded by untreated extract. The leaves, bark, roots and green husks of black walnut have all been extracted for folk medicines, ranging from laxatives, gargles and astringents to colic medicine and salves for external application to wounds and gangrene. Walnut bark extract was once sold as “bitters”, bought mostly as a strong source of ethyl alcohol rather than for medicinal purposes. The husks are said to contain a vermifuge; their extract has been taken for tapeworm and applied to gardens and lawns. This practice may be detrimental to certain plants, like tomatoes and potatoes, which have shown sensitivity to substances produced by the leaves and roots of walnut. *Juglans nigra* has allelopathic properties, killing back, or at least inhibiting, seedlings of herbs and other tree species in the vicinity. Black walnut is perhaps the most highly prized wood of temperate North America. Its use in cabinet and furniture making dates back to some of the earliest colonial settlements. It is a dark wood with purplish hues, light for its strength and very durable; it does not splinter, and it has great resiliency—characteristics that have made it extremely desirable for gun stocks. During wartime, the walnut tree was much depleted from our forests for this purpose, and its wood was once used widely for airplane propellers. When it was much more abundant, walnut was used in construction of homes and barns, in coach-building, for wheels, tools, fences, railroad ties and a number of everyday items. Now it is so valuable that it is mostly used as a thin veneer in furniture and paneling. Walnut is also easily carved, and it finds its way into contemporary sculpture. Black walnut is often cultivated as a yard tree. When grown in full sunlight it develops a stately appearance with a tall, blackish-brown bole and open, spreading crown. Because the black walnut leafs out late in the spring, ruthless wood-seekers have often been able to fool land owners, who have even paid to have someone remove their “dead” walnuts. As the price of a single, large trunk climbed over the twenty thousand dollar mark, some exploiters found it profitable to steal trees using helicopters. With their depletion in American forests during World War II, the federal government and many states began encouraging the planting of black walnuts. While not recommended for planting near gardens, they make excellent yard and pasture trees.

Rare Escape: Carpathian Walnut, a cultivar of *Juglans regia* L., has been seen producing seedlings on Long Island after planting, and it has spread aggressively on Cruger’s Island in Dutchess County. It is a large tree with silver-gray, young bark, and leaves with 7–9 broad, oval leaflets that are tawny beneath. Plants now cultivated in New York State represent a hardy strain of the less robust English walnut, grown widely further south.

2. CARYA

Common Name: Hickory

Authority: Nuttall, Gen. 2, p. 221, 1818

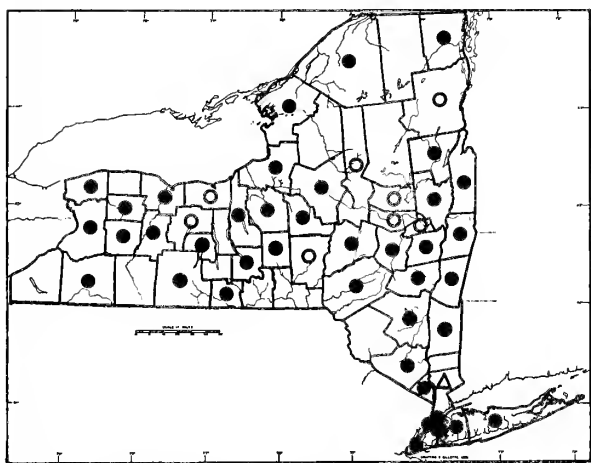
A genus of 15–20 species, native mostly to North America with four representatives in eastern Asia. Hickories were much more widespread in the Tertiary, occurring from Eurasia to Alaska and throughout North America. Native species of *Carya* are now restricted to the eastern half of the continental United States and Canada, with some taxa occurring southwestward in Mexico. The hickories are taxonomically difficult, partially due to frequent hybridization among species at the same ploidy levels. The wood of hickories is valuable commercially, and the nuts of several species are edible, notably those of *C. illinoensis* (Wang.) Koch, the pecan, which is a major nut crop in the United States (often misspelled, “*C. illinoensis*”).

Description: Plants monoecious; **female flowers:** stigmas 2, fleshy-papillate, united toward their bases, sometimes lobed or with a basal disc, often persistent; **styles** fused; **ovary** 1, inferior, 2–carpelled, unilocular above, then 2– and 4–chambered toward the base; **ovule** 1, orthotropous; **fruit** a nut within a husk; **seed** 1, thin-walled, filled with a large embryo whose fleshy cotyledons form the “meat” of the nut; **endosperm** absent; **visible perianth** absent, its tissues fused with those of the involucre; **involucre** surrounding the ovary, usually 4–lobed, glandular-scaly, becoming a 4–valved husk, leathery to stony at maturity, dehiscent or partially dehiscent by sutures; **female inflorescence** a terminal cluster or **peduncled** spike of 2–10 flowers; **male flowers:** **stamens** 3–10 (15), ovate; **filaments** very short, free, **anther** sacs oval, yellow to reddish, pubescent, often cleft; **perianth** absent (or rarely with minute sepals in some flowers), replaced by 3 bracts, the primary bract longer than lateral, secondary ones; **male inflorescences** slender, pendulous catkins borne in 3’s (4–5) on common **peduncles** at the base of new growth or summit of previous years twigs; **leaves** odd-pinnately compound: **leaflets** (3) 5–11 (17), the terminal 3 often largest; **petioles** usually terete; **stipules** absent; **buds** with a few valvate (or many imbricate) scales, the terminal bud much larger than laterals; **leaf scars** prominent, deltoid; **twigs** orangish to brown, usually moderately thick with homogeneous **pith**; **bark** variously smooth to splitting and peeling in long strips in some species; **crowns** variable; **trunks** up to 30 (40) meters from spreading **root systems**.

Note: Hickories are most reliably keyed in the field, with mature nuts and bark available. Herbarium specimens are not always identifiable, even by experts. Hybrids may also be confusing.

KEY TO CARYA SPECIES

1. Buds golden, often compressed, their valvate scales densely lepidote-viscid with minute, yellow glands; male catkins clustered just behind the new growth on the wood of the previous year’s twigs1. *C. cordiformis*
1. Buds pale gray or tan, velvety pubescent or smooth and dark red-brown, spheroid to oval, if yellow-glandular, then only sparsely so; male catkins borne on the base of the current years growth(2)
 2. Bracts of male catkins with hispid to stellate surfaces; leaflets mostly 7–9, gray or tan pubescent beneath, with stellate or tufted trichomes(3)
 2. Bracts of male catkins glabrous or with a few long, silky hairs on the surfaces (they may have ciliate margins); leaflets mostly 5–7, often glabrescent beneath.(4)
3. Fruit husks 6–12 mm thick (fruit 4–6 cm long) at maturity; nut compressed and somewhat wedge-shaped at base; young twigs dusky orange; mature bark of trunk exfoliating in strips; terminal buds dark brown.2. *C. laciniosa*
3. Fruit husks 2–5 (6) mm thick, (fruit ca. 3–4 cm long); nut not strongly compressed and/or wedge-shaped at base; young twigs red-brown to gray-brown; bark of trunk ridged and furrowed, not peeling; terminal buds pale brown3. *C. tomentosa*
 4. Bark of mature trunks furrowed and ridged, not scaling, plating or peeling; fruit husk with valves splitting one half the length of the fruit or less.4. *C. glabra*
 4. Bark of mature trunks stripping, scaling or plating; fruit husk with valves splitting to near the base, dehiscence complete at maturity(5)
5. Serrations of mature leaflets glabrous or slightly ciliate, not tufted; fruit husk tough, 2–4 (5) mm thick; nut pale brown, blunt-angled or terete; bark checking and peeling only with age5. *C. ovalis*
5. Serrations of mature leaflets with microscopic tufts of pubescence; fruit husk brittle, 0.5–1.4 mm thick; nut creamy-white (to pale tan), sharp-angled, compressed; even the bark of young trees exfoliating in strips . . .6. *C. ovata*



1. *Carya cordiformis* (Wang.) K. Koch

Common Names: Bitternut, Swamp Hickory, Bitternut Hickory, Pignut, Yellowbud Hickory

Type Description: Wangenheim, Nordam. Holz., 25. pl. 10, fig. 25, 1787

Synonyms: *C. amara* (Michx. f.) Nutt., *C. cordiformis* var. *latifolia* Sarg., *Hicoria cordiformis* (Wang.) Britt. ex Britt. & Shafer, *Juglans cordiformis* Wang.

Origin: North America

Habitats: Swampforests and rich bottomlands to drier, gravelly stream banks and oak-hickory forests, mostly below 2,000 ft

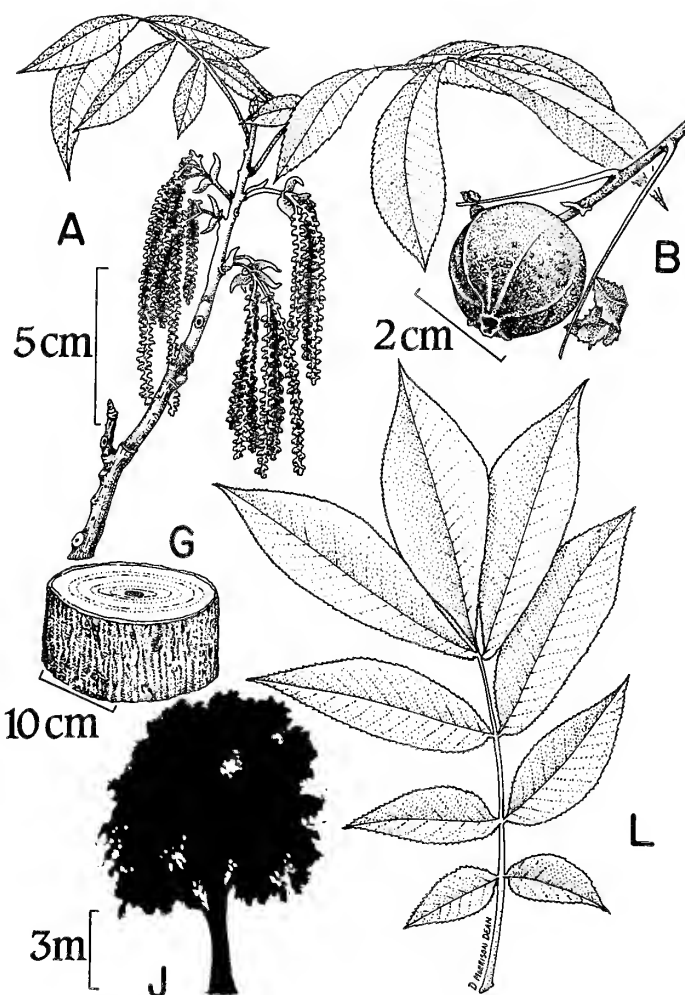
Habit: A medium sized tree with a straight bole and oval crown

Flowering: May–June

Fruiting: August–November

General Distribution: Maine & Vermont to southern Quebec to Minnesota, eastern Nebraska and Kansas, south to Texas and northern Florida

Description: Plants monoecious; **female flowers:** stigmas 2, fleshy-papillose, fused below, erect to somewhat spreading from a 2-lobed, persistent disc, 2–4 mm broad at the ovary tip; **style** obscure; **ovary** 1, inferior; **fruit** (nut only) 1.5–2.2 (2.7) cm long, 1.3–2.3 (2.8) cm broad, gray to tan, spheroid, slightly compressed or distorted, usually visible only in its upper half through the sutures of the partially dehiscent husk; **seed** 1; **perianth** absent, replaced by 4 tiny, deltoid, acute to acuminate, green **involucral lobes** subtending the stigmatic disc, these pubescent abaxially, barely elongating in fruit (1.0–1.4 mm long), persistent; **involucre** urceolate, fused around the flower, ca. 3 mm long, 1 mm broad, its surface at first villous, somewhat lepidote with golden glands as it matures to become the fruit husk; **husk** 1.7–2.5 (3) cm long, 1.7–2.6 (3.2) cm broad, spheroid, bearing the floral remains at its obtuse to acute tip, obtuse at base, leathery, becoming stony 2–3 mm thick, the surface yellow-green to olive-brown, more or less lepidote with golden glands, with 4 (–8) prominent ridges (wings) developing from the apex, $\frac{1}{4}$ to $\frac{1}{2}$ the length of the husk, continuing as less distinct ribs to the base, (indehiscent or) partially splitting by sutures along the ridges, valves mostly less than $\frac{1}{2}$ the husk length, roughly deltoid, often with unequal sutures; **peduncles** short in flower, to 5 mm in fruit, glabrous to puberulent; **female inflorescences:** flowers usually 2 (1–4) clustered at a node on the new growth, subtended by 1 or more lanceolate, villous **floral bracts** up to 4 mm long, the fruits borne singly or often paired; **male flowers:** **stamens** 4 (5) per flower; **filaments** short, free, **anther sacs** oval, sparsely to densely hispid, yellow-green to reddish; **perianth** absent, replaced by 3 greenish bracts; **primary bract** (1) 1.5–2.5 (3) mm long, usually ovate-lanceolate, but linear-lanceolate in some flowers, often near the inflorescence base glabrous to villous; **secondary bracts** 2, ca. 1.5 mm long, ovoid, glabrescent to villous-ciliate, minutely glandular; **pedicels** less than 1 mm long, villous; **male inflorescences:** slender, pendulous catkins borne in threes at the upper nodes of the previous year's twigs, catkins mostly 4–8 cm long; **common peduncles** of the catkins 0.3–2.5 cm long, villous; **bracts**



subtending the basal flowers linear-lanceolate, up to 11 mm long, intergrading with the primary bracts of flowers; **bracts** subtending the male inflorescences strap-like, 1–2 cm long, 4–9 mm broad, reddish or yellow-green, caducous; **leaves** alternate, odd-pinnately compound, with (5) 7–11 leaflets; **leaflets** borne opposite or sub-opposite, 5–15 (19) cm long, 2–8 (10) cm broad, lanceolate or oblanceolate to elliptic-obovate, sometimes falcate, tips acute to acuminate, bases strongly attenuated to obtuse, sometimes inequilateral, margins serrate, sometimes ciliate, upper surface darker yellow-green, smooth at maturity but puberulent, especially on the midveins and when young, lower surface paler, glabrescent to villous with tufts of hairs in vein axils, somewhat lepidote with minute, golden glands, (showing color on drying, and especially conspicuous when young); **petiolules** minute, (except 0.2–0.8 cm long on the terminal leaflet), villous, sometimes deciduous before the axis; **rachises** greenish-brown, densely villous (to glabrescent) mostly 4–20 cm long excluding their similar but shorter **petioles** 2–8 (11) cm long; **fall color** yellow to brown; **stipules** absent; **terminal bud** golden, 0.9–1.8 cm long, 0.4–0.8 cm broad compressed-cylindric with an acute tip, scales valvate, outer ones lepidote, with a dense coating of minute, viscid, yellow glands, shedding to expose white-woolly ones beneath, the wool soon shedding, showing their yellow-glandular surfaces; **lateral buds** similar, smaller, single (or if paired, the upper bud larger); **young twigs** reddish-green, pubescent, later with smooth, gray-brown **bark**, somewhat wrinkled, with pale, oval to linear lenticels; **leaf scars** cordate; **mature bark** dark brown, smooth for many years, becoming grooved and furrowed on large trunks (not scaling in strips); **trunk** with a straight bole and oval **crown**; trees up to 25 (55) m tall, 5–8 (13) dm (d.b.h.) from an early taproot and spreading **root system**. ($2n = 32$)

Infraspecific Variation and Hybridization: Leaf and leaflet size as well as pubescence are extremely variable in these trees. The known hybrid from New York State is a cross with *C. ovata* (Mill.) Koch, designated *C. × laneyi* Sarg.

Importance: Bitternut is the only member of the pecan group (Apocarya), to range northward to New York. The nuts are acrid, bitter and inedible to humans, often ignored, even by squirrels. Early American settlers extracted the nuts for lamp oil. The wood of bitternut is in many ways inferior to that of shagbarks or true pignuts; nevertheless, it has been used in tool handles, hoops, boxes and crates, flooring, bracing and occasionally in furniture. The inner bark has been used in caning chairs. The wood and bark make good firewood and kindling, and both are excellent for cooking and smoking meats. The bitternut is also a good choice for cultivation as a yard tree, especially in difficult situations where the soil is rich and mucky. Bitternut is relatively short-lived for a hickory, usually attaining only moderate size, but there are records of very large trees from rich bottomlands, especially in the Ohio Basin. Pollen of this species is listed as a major airborne cause of allergenic rhinitis.

2. *Carya laciniosa* (Michx. f.) G. Don

Common Names: Shellbark Hickory, Kingnut, Big Shellbark

Type Description: F. A. Michaux, Hist. Arb. Amer. I, p. 199, 1810

Synonyms: *Hicoria laciniosa* (Michx. f.) Sarg., *Juglans laciniosa* Michx. f.

Origin: North America

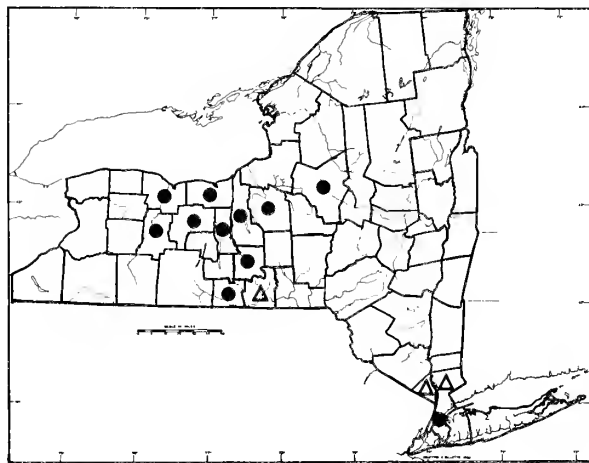
Habitats: Swampforests and alluvia, often on rich, sporadically inundated soils

Habit: A tree with a straight bole and oval crown

Flowering: May–June

Fruiting: September–November

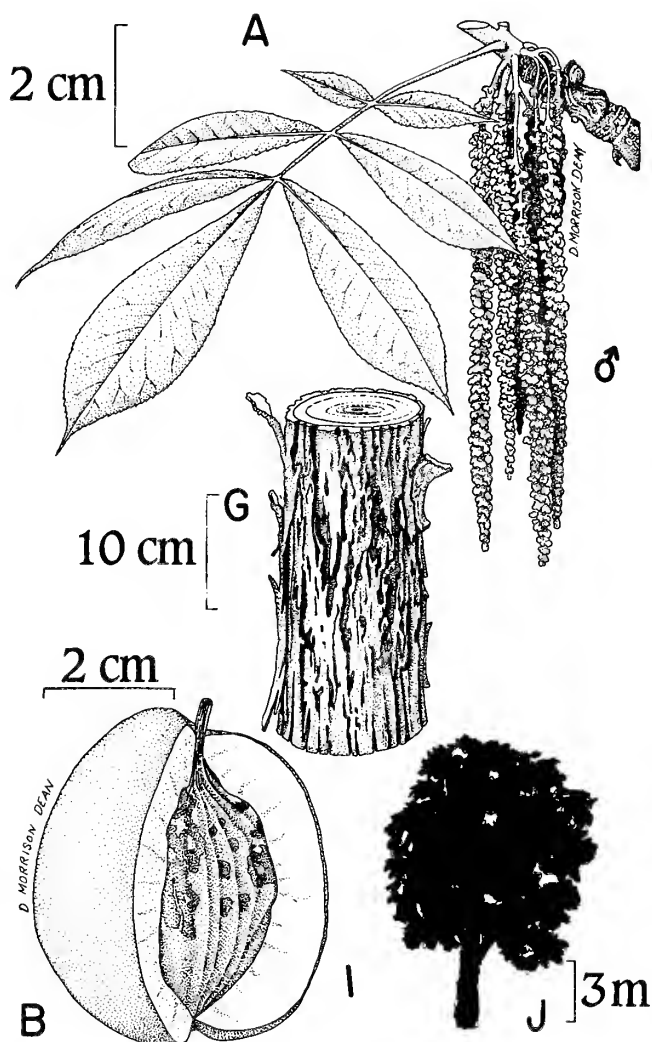
General Distribution: Western New York to s. Ontario, Michigan, Iowa, eastern Kansas and Oklahoma with outliers from Arkansas, Mississippi and Alabama north along the Piedmont to eastern Pennsylvania (Delaware)



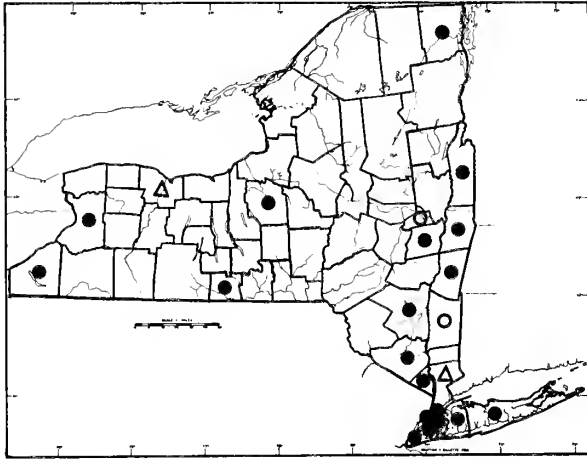
Rarity Status: This tree is considered rare in New York State; fifteen natural occurrences are reported historically from the west-central part of the State. Since it persists at a number of these sites and is secure over a broad distribution range, no protection code is applied by our office. The New York State Natural Heritage Program lists this species in its rare plant status reports.

Description: Plants monoecious; **female flowers:** stigmas 2, fleshy-papillose, fused below, somewhat spreading from a persistent disc, 2–5 mm broad at the ovary tip; **style** obscure; **ovary** 1, inferior; **fruit** (nut only) ovoid to oblong (2.8) 3.2–4.3 (5) cm long, (2) 2.5–3.5 (4) cm broad, 4 (–6) angled, compressed and somewhat wedge-shaped below bearing the style column and floral remains at the apex and a woody apiculation at base, tan, surface somewhat chalky with bumps and ridges in a roughly reticulate pattern, often marked by a few darker inner husk remains; **seed** 1; **perianth** absent, replaced by 4 tiny, acute to acuminate, green **involucral lobes** subtending the stigmatic disc, villous adaxially, elongating to become 3–4 mm long, often persistent; **involucre** urceolate, fused around the flower, ca. 4 mm long, 2 mm broad, its surface at first villous, later glabrescent as it matures to become the large fruit husk; **husk** 3.5–4.9 (6) cm long, 3.0–3.7 (4.1) cm broad, obovoid to spheroid, its tip emarginate, obtuse at base, leathery, becoming woody, 6–12 (14) mm thick, with a stony surface, orangish to dark chestnut brown with shallow wrinkles and ridges, dotted with oval, orange-gold lenticels, **valves** splitting away completely by 4 sutures along shallow furrows; **peduncles** very short in flower and fruit, glabrous to puberulent; **female inflorescences:** flowers 2–3 on terminal shoot-growth, fruit borne singly or paired near branch tips; **male flowers:** stamens 4 (–6) per flower; **filaments** short, free, **anther sacs** oval, densely hispid, yellow to reddish; **perianth** absent, replaced by 3 greenish bracts; **primary bract** 1.5–3.5 (7) mm long, ovate to lanceolate or linear, surface glandular pubescent to patchy-hispid, sometimes with a few silky hairs; **secondary bracts** ca. 2 mm long, ovoid, short-hispid to glandular or glabrescent; **pedicels** lacking or very short; **male inflorescences** slender, pendulous catkins borne in threes, mostly 7–15 cm long, **common peduncles** 0.5–3.5 cm long, hispid or stellate pubescent; **bracts** subtending the basal flowers linear-lanceolate, up to 7 mm long, intergrading with the primary bracts of those flowers; **leaves** alternate, odd-pinnately compound, with (5) 7–9 (11) leaflets; **leaflets** borne opposite or subopposite, 5–25 (33) cm long, 3–11 (17) cm broad, ovate lanceolate, obovate to oblanceolate (obspatulate), tips acuminate (acute), bases strongly attenuated to obtuse, often inequilateral, margins finely serrate, usually ciliate (or glabrous) upper surface darker yellow-green, smooth at maturity but with stellate hairs on the midveins, especially when young, lower surface paler, tan to silver-stellate, often with tufts of stellate hairs in vein axils, densely (to sparsely) lepidote with minute, golden glands, (showing color on drying, and especially conspicuous when young); **petiolules** minute, (except 0.1–1.4 cm long on the terminal leaflet), stellate, sometimes deciduous before the axis; **rachises** reddish-brown to greenish or gray brown, stellate pubescent, grooved, mostly 6–12 cm long excluding their similar **petioles** of about 3–6 cm; **fall color** orange to yellow or brown; **stipules** absent; **terminal bud** (0.9) 1.2–2.8 cm long, 0.7–2.4 cm broad, oval to spheroid with an apiculate to obtuse tip, outer scales brownish-red, hispid, shedding to expose gray-woolly ones; **lateral buds** similar, smaller, becoming woolly in fall; **young twigs** orange to gray-brown, hispid to stellate at first, then developing a silvery, rippling bark with pale, orange-yellow, oval to linear lenticels; **leaf scars** cordate; **mature bark** gray to ashy white, plating and scaling in long strips; **trunk** with a straight bole and oval **crown**; trees up to 30 meters tall 1–1.2 m (d.b.h.) from a taproot and spreading root system. ($2n = 32$)

Infraspecific Variation: Leaf margins may be ciliate, glabrous or very slightly tufted, as in *C. ovata*. The occurrence of hybrids with that species (*C. × dunbari* Sarg.), has been reported in New York State. Cultivars with thin-shelled fruits are sometimes offered in seed catalogs.



Importance: Shellbark nuts are edible for wildlife and man, and they are gathered actively by squirrels for winter storage. The wood of shellbark has been used in tool handles and for a number of farm implements, spokes, furniture, flooring braces, etc. (see also *C. ovata* with which it shares most economic characteristics). It makes excellent firewood and adds a distinctive taste to open-pit cooking. Green wood and bark are used in smoking meats, particularly pork. The bark has been woven into chairs and hinges and used in caning seats. Horticulturally, it is not planted extensively but it is well-liked by some as a novelty (for its stripping bark) and as a source of nuts. It grows well in mucky soils where some yard trees will not survive. The pollen is listed as an aeroallergen.



3. *Carya tomentosa* (Poir. ex Lam.) Nutt.

Common Names: Mockernut (Hickory), White-heart Hickory, Square-nut (Hickory), Big-bud Hickory

Type Description: Poiret in Lamarck, Encyc. Meth. Bot. 4: 504, 1798

Synonyms: *C. alba* (Mill.) Koch, not Nutt., *Hicoria tomentosa* (Poir. ex Lam.) Raf., *Juglans alba* of authors, not L. (a *nomen confusum*), *J. tomentosa* Poir. ex Lam.

Origin: North America

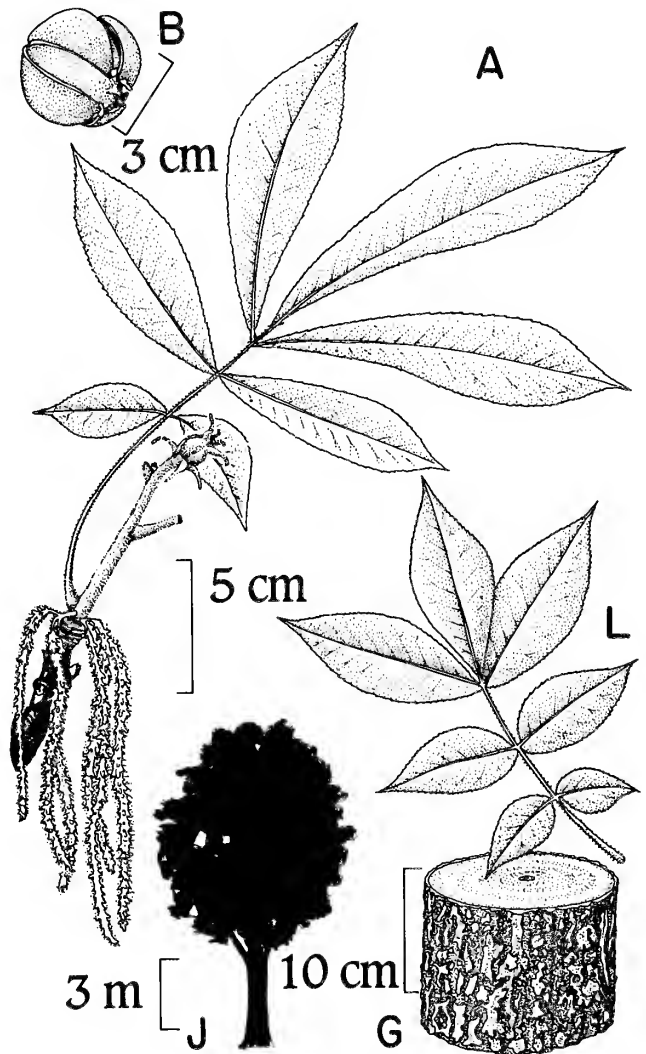
Habitats: A wide variety of forest habitats from dry, sandy pine-plains to rich, moist bottomlands, often with oak, beech and maple

Habit: A small to medium sized tree with a straight bole and oval crown

Flowering: May–June

Fruiting: August–November

General Distribution: New Hampshire to Iowa, south to eastern Texas and northern Florida

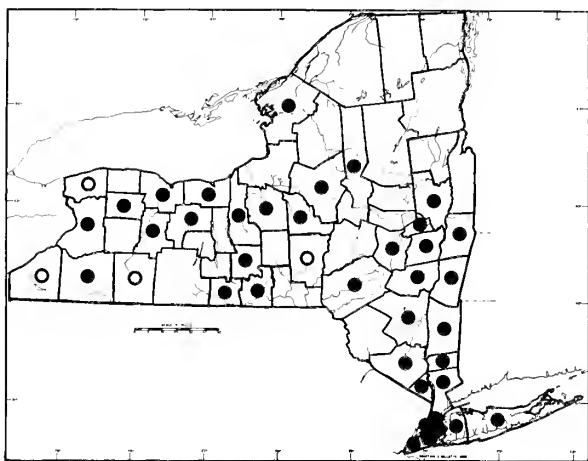


Description: Plants monoecious; **female flowers:** stigmas 2, fleshy-papillose, fused below, erect to somewhat spreading from a persistent disc 2–4 mm broad at the ovary tip; **style** obscure; **ovary** 1, inferior; **fruit** (nut only) ovoid or spheroid, 2.4–3.3 (4) cm long, 2.3–3.1 (4) cm broad, tan to reddish brown, with an undulating, sometimes chalky surface, 4-angled and more or less winged above, the shell 2–4 mm thick, nut often distorted or somewhat compressed within the dehiscent husk; **seed** 1; **perianth** absent, replaced by 4 tiny, acute to acuminate, green **involucral lobes** subtending the stigmatic disc, these elongating to become lanceolate, 2–5 (7) mm long, tufted-pubescent on both surfaces, persistent; **involucre** urceolate, fused around the flower, ca. 4 mm long, 2 mm broad, its surface at first pubescent, often tufted with stellate hairs, also with golden glands, shedding its vestiture as it matures to become the fruit husk; **husk** 2.9–3.7 (5) cm long, 2.8–3.7 (5) cm broad, obovoid to elliptic, obtuse at base, the tip rounded, slightly depressed leathery, becoming stony, 2–5 (6) mm thick the surface dark red-brown with minute wrinkles ridges and a few warty projections, glabrous, partially to completely dehiscent by 4 sutures in depressed grooves, **valves** mostly more than 1/2 the husk length, roughly deltoid, eventually

splitting away to near the base; **peduncles** short in flower and fruit, stellate and puberulent; **female inflorescences**: flowers 2–3, borne on a stout, terminal shoot (sometimes 2 shoots with 3 flowers each), fruit borne singly or often 2 (–4) at the tip of the year's growth; **inflorescence bracts** lanceolate 2–9 mm long, densely woolly and stellate; **male flowers**: **stamens** 4–5 per flower; **filaments** short, free, **anther sacs** oval, sparsely to densely hispid, yellow to reddish; **perianth** absent, replaced by 3 pale, greenish bracts; **primary bract** (1) 1.5–3.5 mm long, obovate to lanceolate or linear-lanceolate, tufted-stellate to pilose or woolly on their surfaces and margins; **secondary bracts** 2, ovate to falcate, 1.5–2.0 mm long, pubescent; **pedicels** very short, flowers sub-sessile; **male inflorescences**: slender, pendulous catkins borne in threes, mostly 7–15 (18) cm long, the axes reddish, stellate-tufted; **common peduncles** 0.8–2.5 cm long, densely to sparsely stellate-tufted, reddish-brown; **bracts** subtending the basal flowers linear-lanceolate, up to 1 cm long, intergrading with the primary bracts of those flowers; **leaves** alternate, odd-pinnately compound, with 5–9 leaflets; **leaflets** borne opposite or subopposite, 6–25 (32) cm long, 3–10 (15) cm broad, ovate-elliptic or obovate to oblanceolate (lanceolate), tips acuminate (acute to obtuse, rarely emarginate), bases strongly attenuated to cuneate or obtuse, sometimes inequilateral, margins serrate, ciliate, upper surface darker green, smooth at maturity but with stellate hairs and tufts on the midveins, especially when young, lower surface paler, permanently gray-pubescent with a "tomentum" of stellate hairs in tufts, particularly in vein axils, densely (to sparsely) lepidote with minute, golden glands, (showing color on drying, and especially conspicuous when young); **petiolules** minute, (except 0.2–1.2 cm long on the terminal leaflet), stellate, sometimes deciduous before the axis; **rachises** reddish-brown, grooved, with a sheen of gray, tufted hairs, mostly 6–20 (33) cm long, excluding their similar, but shorter, **petioles**, 3–10 (13) cm long; **fall color** yellow and brown; **stipules** absent; **terminal bud** 0.9–2.7 cm long, 0.7–1.9 cm broad oval with an acute tip, outer scales pubescent, olive-green to reddish, shedding in autumn to expose gray-woolly inner scales; **lateral buds** similar, smaller, woolly to silky in fall; **young twigs** stout, their surfaces with a tomentum of tufted, stellate hairs, forming red-brown **bark** with pale, oval to linear lenticels; **leaf scars** cordate to strongly 3-lobed; **mature bark** gray to almost black, becoming grooved and furrowed (not scaling in strips); **trunk** with a straight bole and oval, spreading **crown**; trees up to 25 (35) meters tall and 0.5–1.1 m (d.b.h.) from a taproot and spreading **root system**. (2n = 64)

Infraspecific Variation: Mockernut varies somewhat in thickness and dehiscence of the fruit husk, and in density of pubescence on various parts of the plant. Very large leaves (over 50 cm long) may be produced on lower branches, especially by trees in the southern end of the distribution range.

Importance: The mockernut has edible nuts, but they have relatively thick shells and small meats, and are not highly prized; however, they do serve as food for small mammals diligent enough to pry them from their shells. Their name is probably not derived from English, as is stated in many books, but from the Dutch name for the large hammer (moker) required to break them open. The wood is brown, often with a paler center, and is called white-heart hickory in the lumber trade. It is relatively valuable for its resilient properties, and, like other hickories, it has been used in tool and implement production. The tree is very tolerant of different soil and moisture regimes and is easily cultivated over most of the eastern United States. Pollen of mockernut has been listed as a significant aeroallergen.



4. *Carya glabra* (Mill.) Sweet

Common Names: Pignut Hickory, Pignut, Broom Hickory, Black Hickory

Type Description: Miller, Garden. Dict., ed. 8, no. 5, 1768

Synonyms: *C. leiodermis* Sarg., *C. magnifloridana* Murr., *C. microcarpa* Nutt. of some authors, *Hicoria glabra* (Mill.) Britt., *H. microcarpa* (Nutt.) Britt. of some authors, *Juglans glabra* Mill., *J. porcina* Michx. f.

Origin: Arctotertiary North America

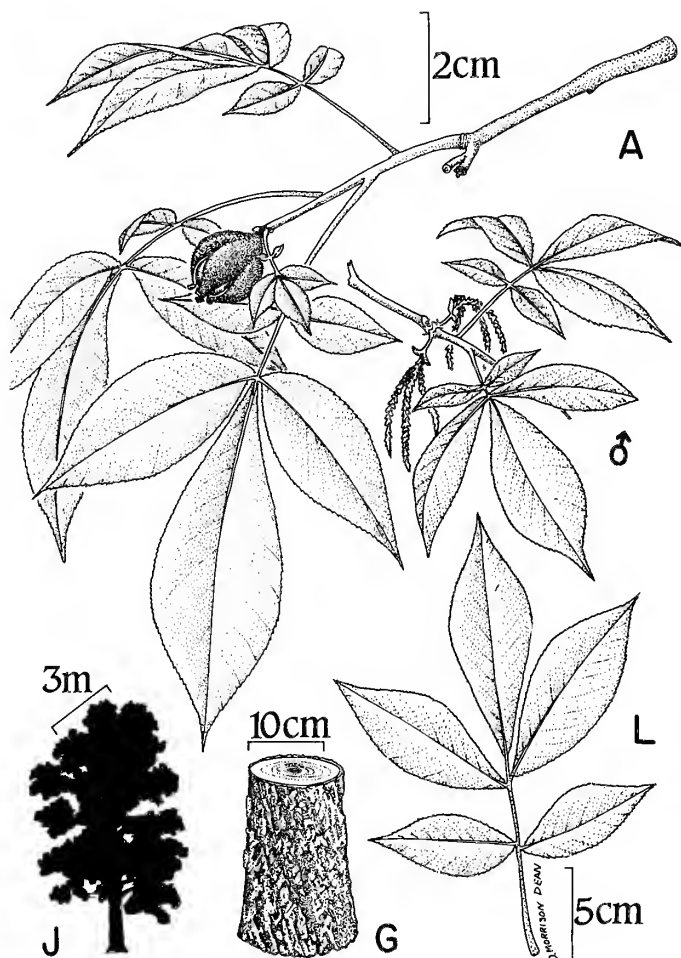
Habitats: Dry, sandy, uplands to rich woodland forests, mostly at elevations below 2,000 ft, often associated with oaks

Habit: A tree with a straight bole and an open, spreading crown

Flowering: May–June

Fruiting: August–November

General Distribution: Southern New Hampshire to southern Michigan, west to Oklahoma, south to Mississippi, central Georgia and North Florida



Description: Plants monoecious; **female flowers:** stigmas 2, fleshy-papillose, fused below, somewhat spreading from a 2-lobed, persistent disc, 2–5 mm broad at the ovary tip; **style** obscure; **ovary** 1, inferior; **fruit** (nut only) ovoid to oblong (or spheroid), 1.5–3.0 (3.9) cm long, 1.3–2.5 (3.5) cm broad, tan, slightly 4-angled or compressed, usually visible only in its upper third through the sutures of the partially dehiscent husk; **seed** 1; **perianth** absent, replaced by 4 tiny, acute to acuminate, green **involucral lobes** subtending the stigmatic disc, these elongating to become lanceolate, ca. 2 mm long, often persistent; **involucre** urceolate, fused around the flower, ca. 4 mm long, 2 mm broad, its surface at first villous, later with a covering of golden glands as it matures to become the fruit husk; **husk** 2.1–3.4 (4.4) cm long, 1.7–3.0 (4.0) cm broad, obovoid, bearing the floral remains at its obtuse tip, strongly attenuated at base, leathery, becoming stony, 2–6 mm thick, the surface dark brown with minute wrinkles, ridges and a few golden glands, with (1) 3–4 prominent ridges developing from the tip to $\frac{1}{3}$ ($\frac{1}{2}$) the length of the husk, continuing as less distinct ribs to the base, (indehiscent or) partially splitting by sutures along the ridges, **valves** mostly less than $\frac{1}{2}$ the husk length, roughly deltoid, often with unequal sutures; **peduncles** short in flower, to 1 cm in fruit, glabrous to puberulent; **female inflorescences:** flowers 2–3 (5) borne in a small, terminal raceme, fruit borne singly or often 2 (–4) at the tip of the years growth; **male flowers:** **stamens** 4–7 per flower; **filaments** short, free, **anther sacs** oval, sparsely to densely hispid, yellow to reddish; **perianth** absent, replaced by 3 greenish bracts; **primary bract** (1) 1.5–2.5 (4.7) mm long, usually ovate-lanceolate, but linear-lanceolate in some flowers near inflorescence base (rarely throughout), glabrous to long-villous; **secondary bracts** 2 (3), ca. 1.5 mm long, ovoid, glabrescent, minutely glandular; **pedicels** lacking or very short; **male inflorescences:** slender, pendulous catkins borne in threes, mostly 4–8 cm long, **common peduncles** 0.5–3.5 cm long, often glabrous to glandular or sparsely villous; **bracts** subtending the basal flowers linear-lanceolate, up to 7 mm long, intergrading with the primary bracts of

those flowers; **leaves** alternate, odd-pinnately compound, with (3) 5 (7) leaflets; **leaflets** borne opposite or sub-opposite, 5–15 (26) cm long, 2–10 (15) cm broad, ovate-elliptic or obovate to oblanceolate (lanceolate), tips acuminate (acute to obtuse, rarely emarginate), bases strongly attenuated to obtuse, sometimes inequilateral, margins finely serrate, sometimes ciliate (or with small tufts when very young), upper surface darker green, smooth at maturity but with sericeous hairs on the midveins when young, lower surface paler, glabrescent to villous, pilose or sericeous, or with tufts and stellate hairs in vein axils, densely (to sparsely) lepidote with minute, golden glands, (showing color on drying, and especially conspicuous when young); **petiolules** minute, (except 0.2–0.8 cm long from the terminal leaflet), glabrous (to sericeous or stellate), sometimes deciduous before the axis; **rachises** reddish-brown glabrous to pubescent, grooved, mostly 3–9 cm long excluding their similar **petioles** of about the same lengths; **fall color** orange to yellow and brown; **stipules** absent; **terminal bud** 0.9–1.2 cm long, 0.5–0.7 cm broad oval with an acute tip, outer scales smooth, brownish-red, shedding to expose white-woolly ones; **lateral buds** similar, smaller, becoming woolly to silky in fall; **young twigs** with smooth, red brown bark, somewhat canaliculate, with pale, oval to linear lenticels; **leaf scars** cordate; **mature bark** gray to dark brown, becoming grooved and furrowed (not scaling in strips); **trunk** with a straight bole and spreading **crown**; trees up to 30 (35) meters tall, 1–1.3 m (d.b.h.) from a **taproot** and spreading **root system**. ($2n = 64$)

Intraspecific Variation: Among the more controversial North American tree groups, the pignut hickories (comprising the *Carya glabra-ovalis* complex) are well known for the special problems they present. Authorities have continued to disagree on the matter of distinctness of two pignuts at the species level. Manning, (1973b), while providing a key that separated *C. glabra* from *C. ovalis* (Wang.) Sarg., nevertheless lamented the poor condition of specimens available for study, and he outlined the need for more information on bark, husk-dehiscence, fall buds, flowers, and other characters, that require repeated visits to a tree, if its identification is to be reliable. Most variation previously attributed to *C. glabra* falls within the range of so-called varieties of *C. ovalis*, that bridge the two taxa morphologically, and sometimes show unexpected combinations of their characters. Pubescence is variable in both species, as is the abundance of lepidote glands. *Carya glabra* var. *megacarpa* (Sarg.) Sarg., with larger leaflets (up to 25 cm) and fruits (up to 5 cm long), has also been called *C. ovalis* var. *megacarpa* (Sarg.) Ashe. This instance parallels similar transfers of varieties between *C. ovalis* and *C. ovata* (Mill.) Koch. *Carya ovalis* is in many ways intermediate between pignuts and the shagbarks, and it could be considered a morphological bridge if not for complications in ploidy level (see, also, the discussions under *C. ovalis* and *C. ovata*).

Importance: The nut-meat of *Carya glabra* may be tasteless, bitter or sweet. Thin shells have made these nuts a preferred fall food for pigs that have been allowed to run wild for fattening. Squirrels and chipmunks store them in quantities for winter food. The wood was commonly made into brooms and their handles, hence the name, “broom hickory”, and it also found wide use in axe handles and many other tools and utensils. It is heavy, close-grained and extremely durable, and was suitable for making wheels for wagons and early automobiles. It is still used in furniture and as a veneer, and it is excellent for outdoor cooking or as an aromatic firewood. The pignut makes a graceful yard tree with a straight bole, spreading crown and slightly drooping branch tips. The pollen is listed as a major aeroallergen.

5. *Carya ovalis* (Wang.) Sarg.

Common Names: Sweet Pignut, Red Hickory, False Shagbark

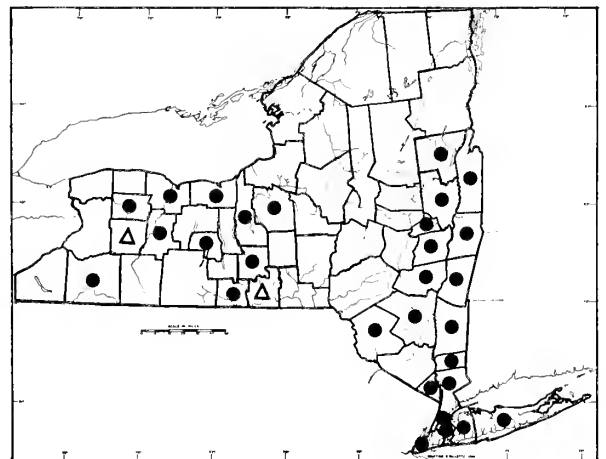
Type Description: Wangenheim, Nordam. Holz, 24. t. 10, fig. 23, 1787

Synonyms: *C. borealis* (Ashe) Schneid., *C. megacarpa* Sarg., *C. microcarpa* Nutt., *Hicoria borealis* Ashe, *H. microcarpa* (Nutt.) Britt., *H. ovalis* (Wang.) Ashe, *Juglans obcordata* Muhl. ex Willd., *J. ovalis* Wang.

Origin: North America

Habitats: Rich forests, from relatively dry to moist conditions

Habit: A medium sized tree with a straight bole and spreading crown



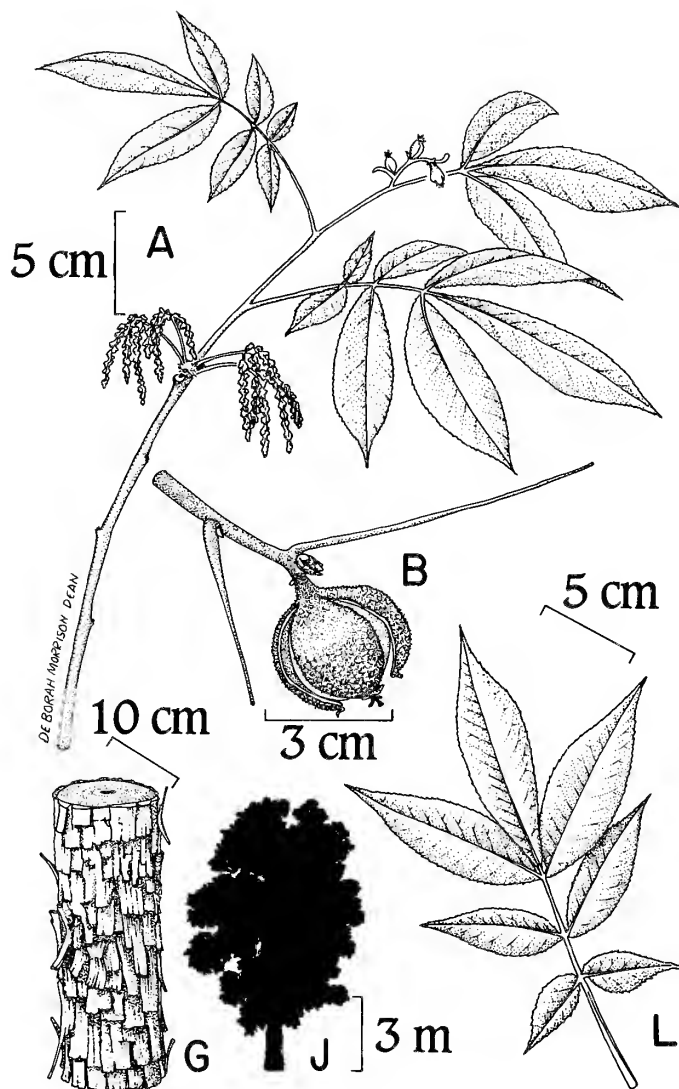
Flowering: May–June

Fruiting: August–November

General Distribution: Southern New England to Michigan and Illinois, south to Louisiana and northern Florida

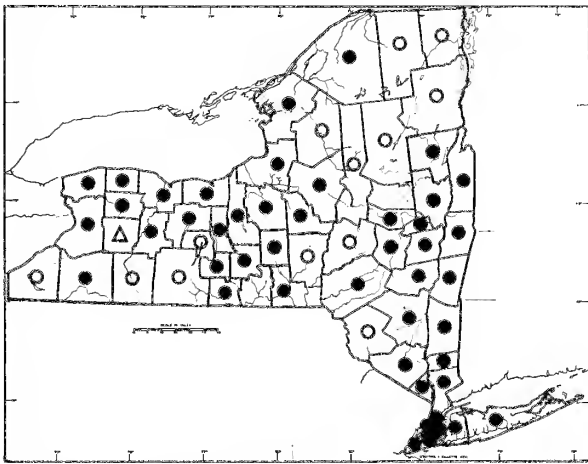
Description: Plants **monoecious**; **female flowers**: stigmas 2, fleshy-papillose, somewhat spreading from a persistent disc, 2–6 mm broad at the ovary tip; **style** obscure; **ovary** 1, inferior; **fruit** (nut only) 1–3 (4.5) cm long and broad, spheroid to oval-oblong, sometimes 4 angled (rarely compressed), tan to brown, exposed after the dehiscence of the valvate husk; **seed** 1; **perianth** absent, replaced by 4 minute, greenish, acuminate **involucral lobes** subtending the stigmatic disc, these elongating to become 2–4 mm long, linear-lanceolate and persistent; **involucre** urceolate, fused around the ovary, ca. 4 mm long, 3 mm broad, lepidote with a covering of golden glands, becoming denser at maturity; **husk** 1.4–4.5 (5.1) cm long and broad, spheroid to ovate, bearing the floral remains at its obtuse tip, obtuse to slightly attenuated at base, leathery becoming stony, 2–5 mm thick, the surface dusky brown (to dark) with wrinkles and ridge or almost smooth, often with a lepidote surface, powdery with golden glands, usually with 4 more or less prominent ridges (sutures) along which the husk splits to (or near) the base on dehiscence, **valves** sometimes incompletely or unequally splitting along sutures, but usually totally breaking away; **peduncles** short in flower, up to 1 cm and stout in fruit, glabrous to puberulent; **female inflorescences**: flowers 2–3 (–5), borne in a small terminal raceme, fruit borne singly or often 2 (–4) at the tip of the year's growth; **male flowers**: **stamens** 4–6 (7) per flower, **filaments** short, free, **anther**

sacs oval, sparsely to densely hispid, yellowish to red; **perianth** absent, replaced by 3 greenish bracts; **primary bract** (1) 1.5–3.5 (4.8) mm long, ovate-lanceolate to linear-lanceolate, often linear near inflorescence base (or throughout), glabrous to long-villous; **secondary bracts** 2 (3), ca. 1.5 mm long, ovoid, glabrescent or minutely glandular; **pedicels** lacking or very short; **male inflorescences** slender, pendulous catkins borne in threes, mostly 4–8 cm long, **common peduncles** 0.5–2.5 (3.5) cm long, often glabrous to yellow-glandular or sparsely villous; **bracts** subtending the basal flowers linear, up to 11 mm long, intergrading with the primary bracts of the flowers; **leaves** alternate, odd-pinnately compound, with (3) 5–7 (9) leaflets; **leaflets** borne opposite or subopposite, 5–18 (28) cm long, 2–12 (14) cm broad, ovate-elliptic or obovate to oblanceolate (lanceolate), tips acuminate (acute to obtuse, rarely emarginate), bases strongly attenuated to acute or obtuse, sometimes inequilateral, margins finely serrate, or minutely dentate, sometimes ciliate (rarely with small tufts of hairs when very young), upper surface darker green, smooth at maturity but with sericeous hairs or tufts on the midveins, lower surface paler, glabrescent to villous, pilose or sericeous, or with tufts and stellate hairs in vein axils, densely (to sparsely) lepidote with minute, golden glands, (showing color on drying, and especially conspicuous when young); **petiolules** minute, (except 0.2–1.1 cm long on the terminal leaflet), sericeous or stellate (rarely glabrous), sometimes deciduous before the axis; **rachises** reddish-brown, glabrous to densely stellate-pubescent, grooved, mostly 3–9 cm long excluding their similar **petioles** of about the same length; **fall color** orange to yellow and brown; **stipules** absent; **terminal bud** 0.7–1.5 cm long, 0.4–1.3 cm broad, spheroid to oval with an obtuse to acute tip, outer scales smooth, brownishred, shedding to expose white-woolly ones; **lateral buds** similar, smaller, becoming woolly to silky in fall; **young twigs** with smooth, red-brown, ribbed **bark** and pale, oval to linear lenticels; **leaf scars** cordate; **mature bark** gray to dark brown, becoming grooved and scaling in strips and rectangular chips with age; **trunk** with a straight bole and spreading **crown**; trees up to 30 (35) meters tall, 1–1.3 m (d.b.h.) from a **taproot** and spreading **root system**. (2n = 32)



Intraspecific Variation: This species is well known for its broad range of variability. A number of varieties have been based on pubescence, glands, nut-shape and sutures of the husk. Bark and fruit characters span the gap between pignuts and shellbarks, so it is very tempting to propose a hybrid origin for this species; however, the pignuts are tetraploid ($2n = 64$) and shagbark and shellbark have been reported as the only diploid ($2n = 32$) species in their section of the genus. Considering the possibility that two ploidy levels may yet be found in these taxa, hybrid origin of *C. ovalis* may still be worth future consideration. A triploid bridge or some sort of amphiploidy might eventually serve as partial explanation for the intergrade. The application of both "microcarpa" and "megacarpa" as varietal names suggests that more than two parent-species could have been involved in past gene exchanges. Both *C. ovata* (Mill.) Koch and *C. laciniosa* (Michx.) D. Don are candidates for parent-species. Even the common names, "sweet pignut" and "false shagbark", suggest intermediacy, and some authors have chosen to recognize *C. ovalis* only as a "hybrid". Another suggested relationship is with the pecans (Apocarya). Stone *et al.* (1969), while discussing oil and fat similarities, suggested affinities with Apocarya, and the occasional wings of the upper sutures of sweet pignuts lend some evidence to that line of thought. The range of distribution of *C. ovalis* is similar to that of *C. glabra*, but it is commonly found in more mesic habitats. Further cytological and demographic studies would undoubtedly enhance our understanding of this group.

Importance: The nut-meat of *C. ovalis* is usually sweet and attractive to wildlife. The wood is not distinguished from pignut in the trade, and it is useful in the same ways. As a lawn or street tree the sweet pignut is in some ways more interesting than pignut, and though it sheds its bark in an interesting pattern, it is not quite as dirty as shagbark. The pollen is listed as an aeroallergen.



6. *Carya ovata* (Mill.) K. Koch

Common Names: Shagbark Hickory, Shagbark, Shellbark

Type Description: Miller, Gardn. Dict., ed 8, No. 6, 1768

Synonyms: *C. alba sensu* Nutt., not L., *C. caroliniae-septentrionalis* (Ashe) Engl. & Graebn., *C. ovata* var. *fraxinifolia* Sarg., *C. ovata* var. *nuttallii* Sarg., *C. ovata* var. *pubescens* Sarg., *Hicoria alba sensu* Britt., not L., *H. ovata* (Mill.) Britt., *H. borealis* Ashe

Origin: North America

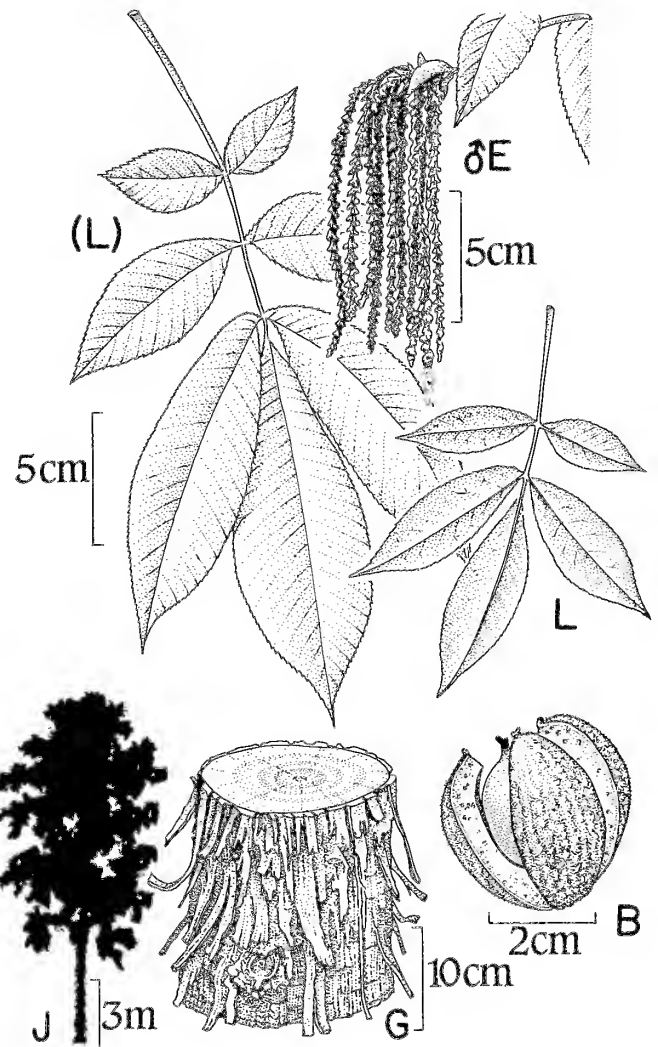
Habitats: Dry to moist, rich soils, damp ravines and bottoms; moderately shade tolerant, often with northern hardwoods

Habit: A tree with a straight bole, peeling bark and an open, oblong crown

Flowering: May-June

Fruiting: September-November

General Distribution: Maine and southern Quebec to Minnesota, eastern Nebraska and Texas, southeast to the Georgia Piedmont



Description: Plants **monoecious**; **female flowers:** **stigmas** 2, fleshy-papillose, fused below, somewhat spreading from a persistent disc, 2–6 mm broad at the ovary tip; **style** obscure; **ovary** 1, inferior; **fruit** (nut only) spheroid or compressed-ovoid (to oblong), somewhat beaked, retaining the floral remains after dehiscence, 2.3–3.4 (4.2) cm long, 2.1–3.5 cm broad, pinkish-white to tan, sharply 4-angled, keeled; **seed** 1; **perianth** absent, replaced by 4 acute to acuminate, green **involucral lobes** subtending the stigmatic disc, these elongating to become lanceolate, 2–3 mm long, often persistent; **involucre** urceolate, fused around the flower, ca. 3 mm long, 2 mm broad, its surface at first villous, later with a covering of golden glands as it matures to become the fruit husk; **husk** 3.3–4.0 (5) cm long, 3–4 (4.7) cm broad, spheroid to obovoid with floral remains at its obtuse to emarginate tip, acute to obtuse at base, leathery, becoming stony, 3–12 mm thick, the surface dark brown, wrinkled to smooth or with a few golden glands, with 4 sutures over most of the length of the husk, **valves** eventually splitting to the husk base and falling away; **peduncles** very short in flower, glabrous, the fruit virtually sessile; **female inflorescences:** **flowers** 2 (–4) borne on short shoots terminally, fruit borne singly or often 2 at the tip of the years growth; **male flowers:** **stamens** 4–6 (7) per flower; **filaments** short, free, **anther sacs** oval, sparsely to densely hispid, yellow to reddish; **perianth** absent, replaced by 3 greenish bracts; **primary bract** 1–2.5 (5) mm long, usually lanceolate to linear (ovate in some flowers) extremely long near inflorescence base, glabrous to puberulent on the surface or with a few marginal hairs; **secondary bracts** 2 (3), ca. 1.5 mm long, ovoid, glabrous on surface but sometimes ciliate, minutely glandular; **pedicels** lacking or very short; **male inflorescences:** slender, pendulous catkins borne in threes, mostly 5–12 cm long, **common peduncles** 1.5–6.5 cm long, densely hispid to sparsely villous; **bracts** subtending the basal flowers linear, up to 1.8 cm long, pubescent, intergrading with the primary bracts of those flowers; **bracts** subtending the inflorescence conspicuous, up to 7 cm long, 2 cm broad, strap-like to obspatulate, reddish-green, deciduous; **leaves** alternate, odd-pinnately compound, usually with 5 (rarely 7) leaflets; **leaflets** borne opposite or subopposite, 5–22 (30) cm long, 2–10 (16) cm broad, ovate-elliptic or obovate to oblanceolate (lanceolate), tips acuminate (acute to obtuse, rarely emarginate), bases acute to obtuse, sometimes inequilateral, margins finely serrate, ciliate and with **tufts** of hairs when young, mature serrations with more pronounced tufts of pubescence, upper surface darker yellow-green, smooth at maturity but with stellate hairs on the midveins, especially when young, lower surface paler, glabrescent to densely white-stellate or with tufts in vein axils, sparsely lepidote; **petiolules** minute, (0.3–1.4 cm long on the terminal leaflet), puberulent, often lepidote, sometimes deciduous before the axis; **rachises** red-brown, puberulent to short-hispid, terete, mostly 3–7 (10) cm long excluding their similar **petioles** of about the same lengths; **fall color** yellow and brown; **stipules** absent; **terminal bud** 0.6–1.1 (2.2) cm long, 0.5–1.0 (1.6) cm broad, oval with an acute tip, outer scales brownish-red, pubescent, acute to cuspidate, shedding to expose white-woolly inner scales; **lateral buds** similar, smaller, divergent; **young twigs** with smooth to wrinkled, red brown **bark** (becoming grayish) and conspicuous pale, oval to linear lenticels; **leaf scars** cordate to deltoid or semi-circular; **mature bark** of trunk soon scaling into long plates and strips, silvery to dark gray, bleaching almost white; **trunk** with a straight bole and open, oval **crown**; **trees** up to 25 (35) meters tall, 1 (1.3) m (d.b.h.) from a deep **taproot** in youth and a widely spreading, suckering **root system**. (2n = 32)

Intraspecific Variation and Hybridization: Although shagbarks are often described as glabrous, they may show a broad range of pubescence. Varieties have been named on the basis of pubescence types, leaflet shape and fruit size. Small-fruited, narrow-leaved plants of the southeastern states, which were long known as *C. carolinae-septentrionalis* (Ashe) Engl. & Graebn., are probably best recognized as *C. ovata* var. *australis* (Ashe) Little. Shagbark also shares a number of characters with sweet pignut, as discussed above under *C. ovalis*. Shagbark hybrids reported from New York State are: *C. cordiformis* × *ovata* = *C. × laneyi* Sarg., and *C. laciniosa* × *ovata* = *C. × dunbari* Sarg.

Importance: The nuts of shagbark are eaten by squirrels and other wildlife, and they even reach the market for human consumption when plentiful. They were once grown in groves commercially, but most of nuts now used are from wild or yard-grown trees. The nuts may be eaten raw or cooked into puddings, cookies or cakes. They were highly prized as storable winter food by American Indians who also extracted their creamy oil (“milk”) for cooking. The oil was later used by settlers to burn in lamps. Nuts and oil are obtained by boiling cracked fruits, whose husks have high specific gravity and separate, sinking to the bottom. The sap of shagbark is relatively high in sugar, and a syrup may be made from it. Bark of the tree has been woven into baskets, and green wood and bark were used as door hinges by some pioneers. The wood is shock resistant, rendering it useful for tool handles, spokes, bows, barrel hoops, ladder rungs and various farm implements. The wood is one of the most highly regarded firewoods, and it adds an excellent taste to cooking. Green shagbark wood is also prized for smoking bacon and hams. Pollen of shagbark is listed as an aeroallergen. Horticulturally, shagbark is a slow growing, often beautifully formed tree when standing alone. The dirty aspect of peeling bark is offset enough by its novelty to warrant planting shagbark as a yard and park tree.

Myricaceae (Myrtle Family)

The Myricaceae: a family of two (3) genera of subshrubs or small trees. They are usually aromatic and often bear nitrogen-fixing nodules on their roots. Members of this family are known from acid dunes to moist soils, particularly shorelines, throughout the North Temperate Zone, with some representatives distributed south to Africa and South America. The single species of *Comptonia* and two species of *Myrica* are known from New York State. Evergreen *Myrica cerifera* L. is known north to the New Jersey shore, but reports of this species from New York are in error. The Myricaceae are of little economic importance other than for scented candle-wax, but their nitrogen-fixing capabilities have made them good early invaders of hostile habitats (along with alders). They are known from the fossil record since the Cretaceous, and their pioneering role in the on the barren, northern shores of ancient and post-glacial times was undoubtedly significant.

FAMILY DESCRIPTION

Diminutive shrubs to small trees, with alternate, simple, deciduous or evergreen leaves, their margins dentate or serrate (entire) or pinnatifid. Plant parts often glandular, aromatic, exuding various oils or scented waxes. The branches are woody with raised leaf scars, estipulate (except *Comptonia*). The roots are fibrous, sometimes adventitious from rhizomes, and bear nitrogen-fixing nodules. Plants are dioecious, monoecious or polygamo-monoecious, with male and female flowers borne (usually separately) in dense, globose to cylindric catkins. Male flower with 2 to many stamens (often 4–8) borne in the axil of a primary bract, sometimes with secondary bracts (bracteoles). Filaments free or united; anther sacs dehiscent by vertical slits. Female flower with a single, superior ovary of 2 carpels (but a single locule) and an orthotropous, basal ovule. A perianth is lacking. The ovary is subtended by one or more series of bracts variously (often incorrectly) called primary, secondary bracts or bracteoles. Occasional flowers may be perfect, in which case stamens are (2) 3–4. The fruit is a drupe, nut-like or an achene, smooth or with protuberances, subtended by bracts in some, or enveloped in a waxy coating. The seed is erect, thin-walled with a straight embryo; endosperm is minute or lacking.

KEY TO GENERA

1. Leaves pinnatifid, linear to oblanceolate, with (deciduous) stipules; fruiting cluster spheroid, bur-like with a dense fringe of setiform bracts and styles radiating 4–8 mm beyond the surface. 1. *Comptonia*
1. Leaves entire to serrate or dentate, often obovate, not linear-pinnatifid, lacking stipules; fruiting body not conspicuously fringed, short-cylindric or a cluster of waxy drupes 2. *Myrica*

1. COMPTONIA

Common Name: Sweet-fern

Authority: L'Heritier ex Aiton, Hort. Kew. 3: 334, 1789

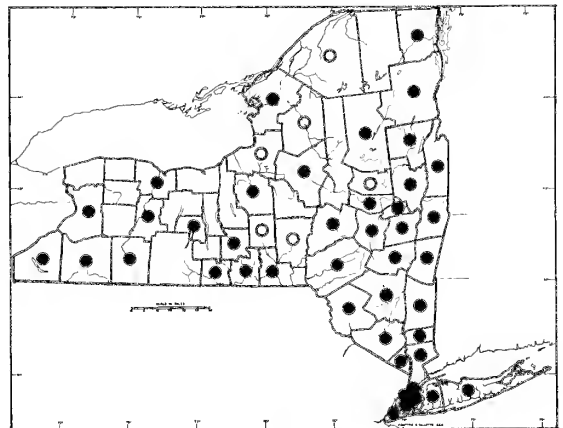
A monotypic genus, sometimes treated as a species of *Myrica*. The plants have a distinctive appearance and odor, and they are sometimes used for decorative purposes. They are cultivated occasionally in sandy soils.

1. *Comptonia peregrina* (L.) Coult.

Common Names: Sweet-fern, Fern-gale, Shrub-fern, Meadow-fern

Type Description: Linnaeus, Species Pl., p. 999, 1753

Synonyms: *C. aspleniifolia* (L.) L'Her ex Ait., not Banks ex Gaertn., *C. peregrina* var. *aspleniifolia* (L.) Fern., *Liquidambar peregrina* L., *L. aspleniifolia* L., *Myrica aspleniifolia* L., *M. aspleniifolia* var. *tomentosa* (Chev.) Gleason, *M. peregrina* (L.) Kuntze



Origin: North America

Habitats: Sandy soils, pine-oak barrens, open, acid forests, meadows, clearings and borders

Habit: A lax to erect subshrub or bush

Flowering: April–May

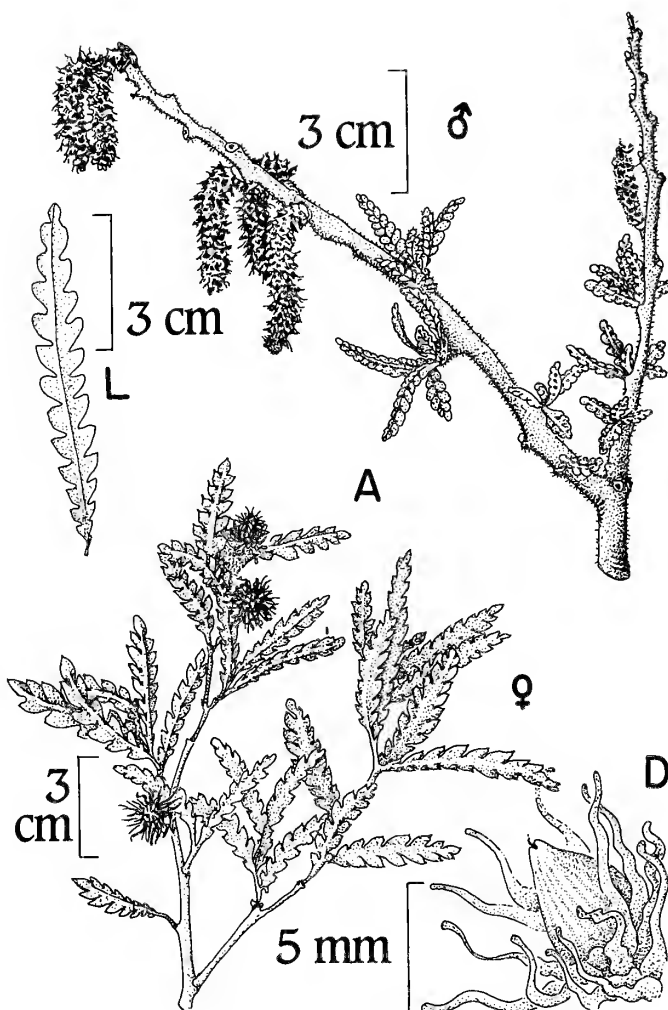
Fruiting: July–September

General Distribution: Nova Scotia to Manitoba (Sask.), Minnesota south in the uplands to Kentucky, the Carolinas and northern Georgia

Description: Plants **monoecious**, **dioecious** or **polygamous**; **female flower**: **stigmas** 2, linear, 0.8–1.6 mm long, deciduous or semi-persistent; **style** absent; **ovary** 1, smooth, ovoid, unilocular, ca. 1 mm long; **fruit** an achene (nutlet), 5–6 mm long, 2.5–3.3 mm wide, ovate with an obtusely angled tip, rounded to truncated at base, with minute wrinkles and folds, the bony surface shiny, tan to reddish-brown with blue-gray undertones; **seed** 1, basally attached; **perianth** absent; **inner bracts** (so-called “bracteoles”) 8 (7–9), more or less connate at base, accrescent, 2–3 mm broad, partially enclosing the achene, hispid within, their long, linear-subulate tips, up to 8 mm, minutely hispid and yellowglandular; **outer bracts** 2, minute, deltoid to lanceolate, preceding the inner bracts in development; **female inflorescences**: spheroid, bur-like heads, borne on older woody growth, becoming 1.2–1.8 cm broad in fruit (excluding the fringe of bract-tips), each usually bearing 5–8 achenes which protrude from the head in their upper third; **male flower**: **stamens** 3–6 (8); **filaments** short, free, **anther sacs** pale; **perianth** absent; **floral bract** subtending the stamens quadrangular, ca. 2 mm in diameter, glabrescent and yellow-glandular on the surface with strongly ciliate upper margins and an acute to acuminate tip, sessile; **male inflorescences**: dense, flexuous, cylindric catkins 1–4 cm long, 4–7 mm wide, borne near the branch tips before (or concurrent with) the new leaves; **leaves** strap-like, (3) 5–9 (15) cm long 0.4–1.5 (2) cm broad, linear to linear-lanceolate or oblanceolate, pinnatifid, shallowly to deeply incised with many rounded (to acute) lobes, bases cuneate with decreasingly smaller lobes, tips acute to blunt, upper surface dark green, waxy, villous to glabrescent, lower surface pale, densely hispid to villous (or glabrescent) with a conspicuous reticulate venation pattern, yellow-glandular above and below; **petioles** 1–5 (7) mm long (or some leaves sessile) covered with a tomentum or hispidity, often with additional, long, sericeous hairs (as on the midribs); **stipules** tardily deciduous, variously shaped from lingulate to cordate-auriculate with subulate tips, surfaces reddish, glabrescent to hispidulous, margins ciliate; **buds** minute, imbricated, globose to pyramidal, glabrous to densely pubescent; **stems** and young **twigs** gray to dark reddish brown, covered with a dense tomentum as well as long, hispid hairs, partially shedding pubescence on lower branches and **trunks** much branched, with red-brown to almost black bark and rusty, oval lenticels; small, aromatic shrubs with open oval crowns; the deeply penetrating **root systems** also spread and root-sucker, and they have nitrogen-fixing **nodules**. (2n = 32)

Infraspecific Variation: Leaves vary from almost entire to deeply pinnatifid with oval to sharp-pointed lobes. A variety has been based on densely tomentose versus glabrescent leaves and stems. The stipules are also quite variable in shape and pubescence, even on a given branch.

Importance: *Comptonia* is planted as a ground cover, especially on sandy banks, and it can be an attractive cultivar. It is not easy to transplant, and it is most successfully propagated from root suckers or seeds. In folk and Native American medicine the extract of boiled leaves was taken internally to induce labor in childbirth and in milder solution as a tea and to relieve diarrhea. The pollen is an aeroallergen.



2. MYRICA

Common Names: Bayberry, Sweetgale,

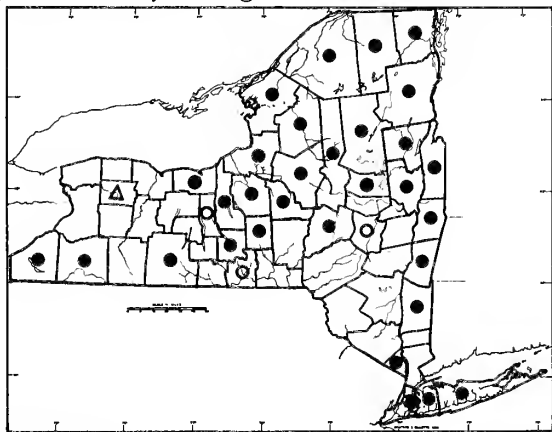
Authority: Linnaeus, Species Pl. II, P. 1024, 1753

A genus of about 40 (-60) species of aromatic, woody subshrubs to small trees, widely distributed in temperate and subtropical climates. They are often found in maritime climates, although the substrates range broadly from dry dunes to saturated muck. Known for the nitrogen-fixing capabilities of bacteria within their root nodules, these plants have apparently played an active historical role in the colonization of barren shorelines. The wax produced by some species is valuable in candle and perfume making.

Description: Plants dioecious, monoecious or polygamous; female flowers: stigmas 2, exserted; style obsolete; ovary 1, superior, of 2 carpels, unilocular, smooth or warty; ovule 1, basal, orthotropous; fruit a drupe or nutlet, achene-like, lenticular to globose, with or without protuberances or a waxy coating; seed 1, bearing a fleshy embryo and little or no endosperm; perianth lacking, replaced by floral bracts; inner bracts ("bracteoles") 2-4 or absent; outer ("primary") bract 1; female inflorescence: small head-like catkins or interrupted fascicles of drupes; male flowers: stamens 2-20, filaments slightly united at base or free; anther sacs dehiscing by slits; perianth absent, replaced by bracts; male inflorescences ovoid to cylindric catkins, often erect; leaves simple, alternate, entire or serrate or dentate, especially near the broader tips; petioles short or lacking; stipules absent; buds small, imbricated; twigs with smooth to scaly bark; open to dense-crowned subshrubs to very small trees; root systems with nitrogen-fixing nodules.

KEY TO MYRICA SPECIES

1. Fruits borne near branch tips in compact, ovoid, cone-like catkins, greenish to brown, minutely golden-glandular, subtended by persistent bracts; most leaves serrate at tips 1. *M. gale*
1. Fruits in loose fascicles on older, woody growth, spheroid with flat-topped protuberances, usually exuding and covered by a white, waxy coating; most leaves entire or weakly serrate 2. *M. pensylvanica*



1. *Myrica gale* L.

Common Names: Sweet-gale, Bog-myrtle, Gale, Dutch-myrtle, Meadow-fern, Scotch-gale, Sweet-willow, Bay-myrtle, Bay-bush, Scotch-myrtle

Type Description: Linnaeus, Species Pl., p. 1024, 1753

Synonyms: *Angeia palustris* (Lam.) Tidestr., *Gale palustris* (Lam.) Chev., *G. palustris* var. *subglabra* Chev., *Myrica gale* var. *subglabra* (Chev.) Fern., *M. palustris* Lam.

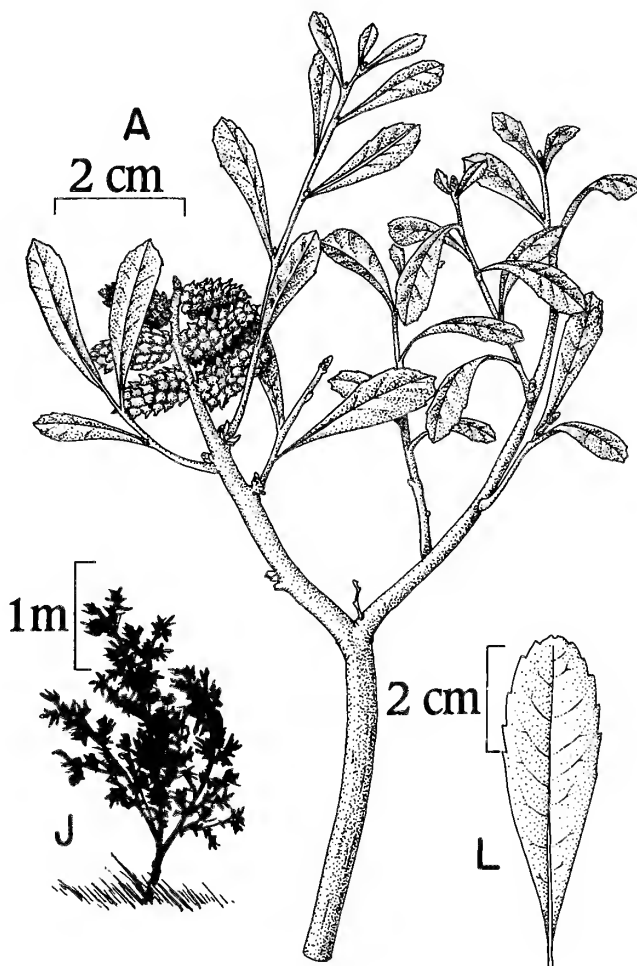
Origin: Native to North America & Eurasia

Habitats: Lake and swamp shores, river and creek banks, shallow water and floodplains in mucky to sandy soils

Habit: Slender, erect or ascending shrub

Flowering: April-June

Fruiting: July-October

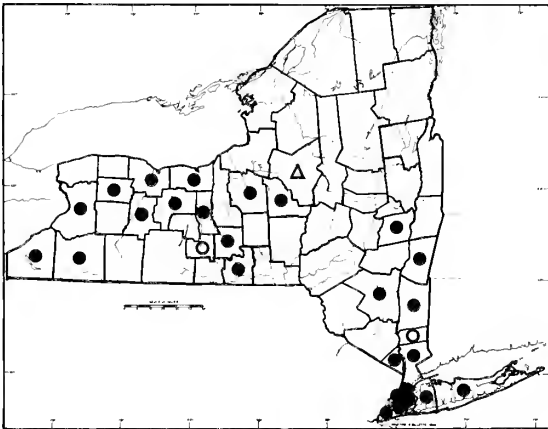


General Distribution: Circumboreal in Eurasia and North America: Labrador to Alaska south to Oregon, southeast to montane North Carolina and Tennessee

Description: Plants **dioecious, monoecious or polygamous**; **female flower:** stigmas 2, linear, ca. 1 mm long, deciduous or semi-persistent; **style** obsolete; **ovary** 1, superior, 2-carpelled, unilocular; **fruit** (nut) loose-coated, achene-like, ovate, smooth and shiny, greenish to brown, 2–3 mm long, ca. 1.5 mm broad, the seed not filling locule at maturity, causing the leathery coat to wrinkle on drying; **perianth** lacking, replaced by bracts; **inner bracts** 2, minute; **outer bract** 1, ovate with an acute to obtuse tip, ca. 2 mm long, 1.5 mm broad, smooth, persistent; becoming somewhat leathery, often with ciliate margins when young; **female inflorescence** a dense, ovoid to short-cylindric yellow-glandular catkin, elongating to 7–14 mm, 5–8 mm broad in fruit; **male flower:** **stamens** mostly 4–9; **filaments** short, **anther sacs** globose, dehiscent by slits; **perianth** absent; **floral bract** broadly deltoid, ca. 2.5 mm long, 3 mm broad, smooth, leathery, brownish with a paler, greenish margin, ciliate, especially on the tips of the lower lobes, sessile at its central point of attachment; **male inflorescence** a compact, sessile, ascending, cylindric catkin, 5–11 mm long, 4–6 mm broad; **leaves** obovate to linear obspatulate, 1–8 cm long, 0.4–2.8 cm broad, the margins somewhat revolute, sharply serrate, but only near leaf tips (rarely cleft), upper surface darker green, tomentose when young to glabrous at maturity, yellow-glandular, lower surface paler, gray-green, densely tomentose (to glabrous), yellow-glandular; leaves subsessile, the **petioles** usually 2 mm or less, tomentose; **stipules** absent; **buds** minute, imbricated; **twigs** dark red-brown or gray to black, densely tomentose or glabrous with age, yellow-glandular with pale, oval lenticels; **bark** dark, smooth or peeling; **trunks** slender, wand-like; **root system** with nitrogen-fixing nodules, widely spreading, suckering. ($2n = 48, 96$)

Intraspecific Variation: Variability in pubescence of the leaves has prompted some authors to recognize *M. gale* var. *subglabra* (Chev.) Fern. There is also considerable variability in the expression of sexuality of aments, involving various kinds of monoecism and polygamy; such differences may be observed on the same branches from year to year.

Importance: Sweet-gale is of little economic importance. It has been used in folk medicine as a tea, but its reputation is marred by reports of ill-effects, especially in Europe, where a strong decoction has been used to induce abortion. It has been used as a substitute for hops in beer-making, and it was mixed with leaves of alders and other plants to produce a primitive toothpaste during American colonial times. The shrub is not often grown ornamentally, and then only in swampy places.



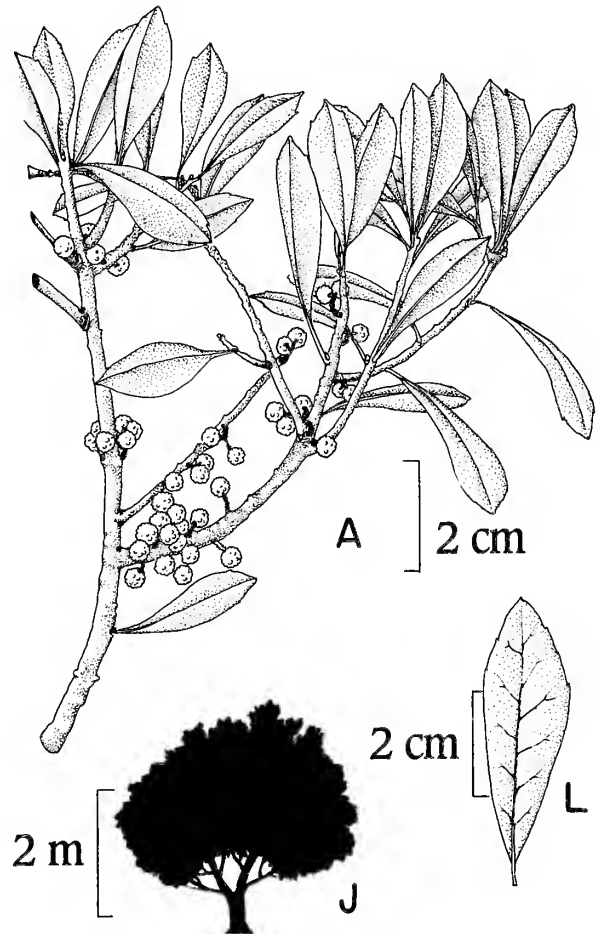
2. *Myrica pensylvanica* Loisel. ex Duhamel

Common Names: Bayberry, Candleberry, Wax Myrtle, Swamp Candle-berry, Waxberry, Northern Bayberry or Wax-myrtle

Type Description: Loiseleur in Duhamel, Traite Arb. 2: 190, 1804

Synonyms: The following binomials have been misapplied: *Certhamnus caroliniensis* (Mill.) Tidestr. of NY authors, *Morella caroliniensis* (Mill.) Small, *Myrica caroliniensis* Mill. of NY authors, *M. cerifera* of NY reports, not L.

Origin: North America



Habitats: Coastal shores, often on dry, sterile soils (to moist places), in New York mostly on Long Island and a few miles inland from the coast of lake Ontario (scattered, marly bogs and swamp-margins)

Habit: A much-branched shrub with a rounded crown (usually deciduous)

Flowering: May–July

Fruiting: July–November

General Distribution: Southern Newfoundland and New Brunswick, inland to Ontario, western New York and Ohio, south to North Carolina on the coast

Description: Plants dioecious or monoecious; **female flower:** stigmas 2, linear, somewhat laminar towards base, ca. 2 mm long, deciduous or semi-persistent; **style** 1, minute; **ovary** 1, superior, 2–carpelled, unilocular, oval; **fruit** a drupe-like nut, spheroid, 4–5 mm in diameter, dark purple (under the wax), verrucose with pedestal-like surface-protuberances which form a reticulate pattern, densely short-hispid, exuding a white to somewhat translucent, waxy coating; **seed** 1, basal; **perianth** absent, replaced by bracts; **inner bracts** 2, minute; **outer bract** ca. 0.5 mm broad, acute, enfolding the ovary at first, deciduous or semi-persistent in fruit; **female inflorescences:** fascicles of a few sessile flowers borne on short, woody short-shoots (“peduncles”) on the older stem growth; **fertile short-shoots** 1–11 mm long, woody, hispid, yellow-glandular and often slightly waxy with flower-bud scars, tiny bracts and minute, lateral buds with imbricated scales; **male flowers:** **stamens** mostly 4–6, exserted from the bract; **filaments** short, free or slightly fused, **anther sacs** ovoid, dehiscing by slits; **perianth** absent; **floral bract** 4–angled, cupped under the stamens, acute to obtuse or emarginate tipped, ca. 1.5 mm broad, smooth, yellow-glandular beneath; **male inflorescences:** dense ovoid to cylindric catkins, 5–15 mm long, 4–6 mm broad, borne laterally or erect on the older, woody twigs, mostly below the leaves; **leaves** alternate, deciduous or tardily so, coriaceous, broadly elliptic to narrowly obovate or oblanceolate, 1.5–7.5 (9) cm long, 0.6–1.8 (2.4) cm broad, with cuneate bases and obtuse, but usually apiculate, tips, margins flat or revolute, (entire or) with a few serrations near the leaf tip, upper surface darker green, densely villous to glabrescent, not glandular, lower surface villous to glabrescent, yellow-glandular; leaves often sub-sessile, **petioles** rarely over 3 mm long, villous; **stipules** absent; **buds** minute; **twigs** stout, yellow-glandular, villous with pale to dark silvery-gray (black) **bark** and irregularly shaped lenticels; **trunk** stout, usually gnarled and short but up to 12 cm in diameter with a dense oval **crown**; shrub (rarely small tree) with nitrogen-fixing nodules on the deeply penetrating, widely-spreading **root system**. (2n = 16)

Infraspecific Variation and Hybridization: These plants vary in their tendency to retain their leaves, especially south toward New Jersey, where they reportedly hybridize with *M. cerifera* L., which is evergreen. Our native plants were long confused with *M. cerifera* and later recognized under one of its later homonyms, *M. caroliniensis* Mill., leading to considerable confusion on herbarium labels and in the literature. The hybrid (*M. cerifera* × *pensylvanica*) is called *M. × macfarlanei* Youngken; it has not yet been reported for New York State.

Importance: *Myrica pensylvanica* and other wax myrtles, such as *M. cerifera* and *M. heterophylla* Raf., are sought for their vegetable tallow (“wax”), which has several uses. This waxy substance, found mostly as an exudate of the fruit, is composed mostly of Palmitin (palmitic acid), which rises to the surface on boiling. Wax myrtle tallow is widely used in the making of aromatic candles, which have attained some local importance in the tourist trade, especially in the Atlantic states. The pleasant odor has also prompted its use in soaps, ointments and medicines of various types. It is added to leather-polishing compounds and employed as a coating material in artists’ etching processes. The bark is eaten by deer, and a bark extract is cited as an emetic, an astringent and as an ingredient in home-made dentifrices. Powdered root-bark has been used in decoctions taken internally for ulcers, inflammations and other intestinal problems. Leaves have occasionally been used in cooking as a flavoring substitute for bay leaves (*Laurus* and *Umbellularia*). The fruits and buds of bayberry are of some importance as wildlife foods. The shrub is occasionally grown ornamentally on poor, coastal soils and on rocky, garden slopes, where it may be especially effective in controlling erosion.

APPENDIX I

FUNGI ASSOCIATED WITH PLANT SPECIES IN THIS TREATMENT

by J. Kenneth Dean

To be included in this list, a fungus must occur on a host species in this treatment, somewhere in the United States. Abbreviations of state names indicate literature citations only. A double asterisk (**) indicates that a NY specimen with host information has been seen. A single asterisk (*) indicates that the fungus occurs in New York State, and is known to associate (elsewhere) with a host treated here.

CHYTRIDIALES

Carpenterella molinea Tehon & Harris, in vessels of *Ulmus americana* (Wisc.)

Synchytrium cellulare J. J. Davis, leaf gall on *Boehmeria cylindrica* (Wisc.)

PERONOSPORALES

Peronospora debaryi Salmon & Ware, on *Urtica* sp. (Wisc.)

Pseudoperonospora humuli (Miy. & Tak.) C.G. Wils., downy mildew on *Humulus japonicus* (widespread), on *Humulus lupulus* (widespread)

Pythium dissotocum Drechs., rootlet rot of *Pilea pumila* (Md.)

Pythium sp., damping off on seedlings of *Ulmus pumila* (Great Plains States)

Phytophthora cactorum (Leb. & Cohn) Schroet., bleeding canker on *Juglans regia* (Calif.), on *Ulmus americana* (R.I. ?)

Phytophthora cinnamomea Rands, seedling root rot of *Juglans nigra* (Md. to Ala., and La.), *Juglans regia* (Md.)

Phytophthora inflata Caroselli & Tucker, on trunks of *Ulmus americana* (Conn., Mass., N.Y., Pa.), on *Ulmus rubra* (Conn., Mass., N.Y., Pa.)

Plasmopara humuli Miyabe & Takahashi, downy mildew on *Humulus lupulus* (Wisc.)

Plasmopara illinoensis (Farl.) J. J. Davis, downy mildew on *Parietaria pensylvanica* (Wisc.)

Pseudoperonospora celtidis (Waite) G. W. Wilson, downy mildew on *Celtis occidentalis* (Md.)

Pythium ultimum Trow, damping off of seedlings of *Maclura pomifera* (Nebr.)

TAPHRINALES

Taphrina ulmi (Fckl.) Johans., leaf blister on *Ulmus americana* (widespread), on *Ulmus procera* (Mass., Wisc.), on *Ulmus rubra* (Kans., Va.), on *Ulmus thomasii* (Ala., Ark.)

MICROASCALES

Ceratocystis ulmi (Buis.) C. Moreau, Dutch Elm Disease, see *Ceratostomella ulmi* (*Sphaeriales*)

Ceratocystis spp., wood stain of *Liquidambar styraciflua* (gulf states)

Endoconidiophora fimbriata (Ellis & Halst.) Davidson forma *platani* Walter, London Plane Tree blight, on *Platanus* × *hybrida* (widespread), on *Platanus occidentalis* (Miss., Pa., Va., W. Va.)

ERYSIPHALES

Erysiphe chichoraceum DC., powdery mildew on *Humulus lupulus* (N.Y., Utah), on *Parietaria pensylvanica*, (** Ohio to Kans., and Wisc.), on *Pilea pumila* (Ill., Ind., Iowa), on *Urtica gracilis* (Ill.)

Erysiphe polygoni DC., on *Juglans regia* (Calif.)

Microsphaeria alni DC., on *Carya tomentosa* (widespread), on *Carya* spp. (Tex.), on *Juglans* spp. (** widespread), on *Platanus occidentalis* (** widespread), on leaves of *Ulmus americana* (Ill., Iowa, Miss., Ohio)

Microsphaeria alni DC. var. *extensa* (Cooke & Peck) Salm., on *Platanus occidentalis* (N.C.)

Microsphaeria penicillata (Wallr.) Lev., on *Juglans cinerea* **, on *Platanus* × *hybrida* **

Phyllactinia corylea Pers., on *Carya cordiformis* (Mich.), on *Carya* sp. (Wisc.), on *Hamamelis virginiana* (Mich., Wisc.), on *Juglans* sp. (Ind., Ohio), on *Morus rubra* (Ohio)

Phyllactinia guttata (Fries) Lev., on *Platanus occidentalis* (Ind.), on *Ulmus americana* (widespread **), on *Ulmus procera* (N.C.), on *Ulmus thomasi* (N.C. to Tex. and Ill.)
Podosphaeria biuncinata Cooke & Peck, powdery mildew on *Hamamelis virginiana* (** New England to Ill. and southward)
Sphaerotheca humuli (DC.) Burr., powdery mildew on *Humulus japonicus* (widespread), on *Humulus lupulus* (widespread)
Sphaerotheca humuli (DC.) Burr. var. *fuliginea* (Schlect.) Salm. on *Humulus lupulus* (Minn.)
Sphaerotheca phytophila Kell. & Swingle, powdery mildew on *Celtis occidentalis* (** Central States to Kans. & Okla.)
Uncinula geniculata Gerard, powdery mildew on *Morus rubra* (N.Y. to Ga., Ala., Kans.)
Uncinula macrospora Peck, powdery mildew on *Ulmus americana* (widespread **), on *Ulmus rubra* (Va. to Ind. and Mo.)
Uncinula parvula Cooke & Peck, on leaves of *Celtis occidentalis* **
Uncinula polychaeta (Berk. & Curtis) Ellis, powdery mildew on *Celtis occidentalis* (southern states)

DIAPORTHALES

Apioportha apiospora (Ellis & Holw.) Wehm., canker on twigs of *Ulmus americana* (Iowa)
Apioportha phomaspora (Cooke & Ellis) Wehm., on twigs of *Myrica*
Cryptodiaportha aubertii (West.) Wehm. var. *comptoniae* (Schw.) Wehm., on stems of *Comptonia peregrina* (Mass., N.J., N.Y.)
Cryptosporella aurea (Fekl.) Sacc., * on *Liquidambar styraciflua* (Ga.)
Cryptosporella hypodermia (Fr.) Sacc., on *Ulmus americana* (Mass., Tex.)
Diaportha apocrypta (Cooke & Ellis) Sacc., on branches of *Carya* sp. (N.J., Ohio)
Diaportha arctii (Lasch) Nits., on *Platanus occidentalis* (Ga.)
Diaportha bicincta (Cooke & Peck) Sacc., see *D. spiculosa*
Diaportha comptoniae (Schw.), on *Comptonia peregrina* **
Diaportha eres Nits. (= *Diaportha castaneti* Nits., *Diaportha ulmicola* Ellis & Everh.), on *Platanus occidentalis*, on *Ulmus americana* (Mich., Okla.), on *Ulmus procera* (Mass.)
Diaportha hicoriae Wehm., on branches of *Carya glabra* (Mich.)
Diaportha juglandis Ellis & Everh. see *Melanconis juglandis*
Diaportha phomaspora (Cooke & Ellis) Sacc., on *Myrica gale* **, on *Myrica pensylvanica* **
Diaportha spiculosa (Alb. & Schw.) Nits. [= *Diaportha bicincta* Cooke & Peck] Sacc., on branches of *Juglans cinerea* **, on *Juglans* sp. (Iowa, Mich., N.Y.)
Diaportha tecta (Cooke) Sacc., on *Myrica pensylvanica* **
Diaportha ulmicola Ellis & Everh., on *Ulmus* sp. (Ontario)
Diaportha woolworthii (Peck) Sacc., on *Carya cordiformis* **, on *Carya ovata* **
Endothia gyrosa (Schw.) Fekl., on dead branches and exposed roots of *Liquidambar styraciflua* (Md. to Gulf States), *Ulmus americana* (Ga.)
Endothia parasitica (Murr.) P.J. & H.W. Anderson, Chestnut Blight on *Carya ovata*
Gnomonia caryae Wolf, on *Carya cordiformis* (Wisc.), on *Carya glabra* (N.Y.**, Okla.), on *Carya tomentosa* (Conn. to Ill.), on *Carya* sp. (N.Y. to Ga. and La.)
Gnomonia clavulata Ellis, on fallen leaves of *Carya* sp. (N.J.)
Gnomonia dispersa Demaree & Cole, on fallen leaves of *Carya* sp. (Fla., Ga.)
Gnomonia leptostyla (Fr.) Ces. & DeN. (= *Marssonina juglandis*), on all species of *Juglans* (widespread)
Gnomonia myricae Cooke & Ellis, on leaves of *Myrica pensylvanica* (Ga.)
Gnomonia setacea (Pers.) Ces. & DeN., on *Carya* spp. (widespread)
Gnomonia setacea (Pers.) Ces. & DeN. var. *caryae* Dearn. & House, on *Carya glabra* **
Gnomonia ulmea (Schw.) Thum. (= *Gloeosporium ulmeum* Miles), black spot on *Ulmus americana* (widespread **), on *Ulmus procera* (N.J.), on *Ulmus pumila* (widespread), on *Ulmus rubra* (widespread), on *Ulmus thomasi* (** Ill., Okla., Tex., Va.)
Gnomonia veneta (Sacc. & Speg.) Kleb. (= *Gnomonia platani* Edg.), on *Platanus occidentalis* (widespread)
Gnomoniella amoena (Nees) Sacc. var. *petiolorum* (Schw.) Sacc., on *Liquidambar styraciflua* (Ga.)
Massariovalsa sudans (Berk. & Curtis) Sacc. (= *Melanconiopsis inquinans* Ellis & Everh.), on twigs of *Carya glabra* (Ga., N.J.), on branches of *Carya* sp. (Ga., N.J.), on *Ulmus* sp. (Ontario)
Melanconiella pallida Rehm. (perfect state of *Melanconium pallidum*), on branches of *Carya* sp. (N.Y. to Ohio)
Melanconis hicoriae Wehm., on branches of *Carya tomentosa* (Ala.)
Melanconis juglandis (Ellis & Everh.) Graves, on *Juglans cinerea* (widespread **)

Melanconis macrosperma Tul., on branches of *Carya* sp. (Mich., Neb., N.J.)
Melanconis pallida (Rehm) Wehm., on *Carya cordiformis* (Mass., Mich.), on *Carya ovata* (Mass., Mich.)
Melanconis sudans (Berk. & Curtis) Wehm., on branches of *Ulmus americana* (Mich., Pa.)
Phragmodiaporthe caryae (Peck) Wehm. (= *Cryptospora caryae* Peck), on *Carya ovata* **, on *Carya* sp. (N.Y. **)
Prosthecium ulmi Wehm., on branches of *Ulmus americana* (Mich.), on *Ulmus rubra* (Iowa)
Pseudovalsa haplocystis Berk. & Br.) Sacc., on *Platanus occidentalis* **
Valsa ambigens Pers., on dead branches of *Hamamelis virginiana* (cosmopolitan **), on *Ulmus americana* (widespread **)
Valsa americana Berk. & Curtis, on *Carya glabra* **
Valsa caryigena Berk. & Curtis, on *Carya glabra* **
Valsa conspurcata (Schw.) Cooke, on *Liquidambar styraciflua* (Ga.)
Valsa juglandicola Schw., on *Carya glabra* **
Valsa liquidambaris (Schw.) Cooke, on *Hamamelis virginiana* **, on
Liquidambar styraciflua (N.J., S.C.)
Valsa macluræ Cooke & Ellis [= *Eutypella macluræ* (Cooke & Ellis) Ellis & Everh.], on dead branches of *Maclura pomifera* (Kans., N.J.)
Valsa morigena Berk. & Curtis, on *Morus alba* (Ga.)
Valsa platani Schw., on *Platanus occidentalis* **
Valsa quercea Curr., on *Myrica pensylvanica* **
Valsa sordida Pers., on dead twigs of *Ulmus americana* (widespread)

CORONOPHORALES

Coronophora angustata Fekl., on *Myrica* sp. **

SORDARIALES

Chaetosphaeria pannicola (Berk. & Curtis) Sacc., on *Platanus occidentalis* (Ga.)
Lasiosphaeria hirsuta (Fr.) Ces. & DeN., on decayed wood of *Juglans cinerea* **, on *Juglans nigra* (S.C.), on dead bark of
Ulmus sp. **
Lasiosphaeria ovina (Pers.) Ces. & DeNot., on *Ulmus americana* **
Lasiosphaeria pezizula (Berk. & Curtis) Sacc., wood stain in *Liquidambar styraciflua* (Ill.)

CALOSPHERIALES

Calosphaeria myricæ (Cooke & Ellis) Ellis & Everh., on *Myrica pensylvanica* **

XYLARIALES

Anthostoma amygdalinum (Cooke) Sacc., on bark of *Liquidambar styraciflua* (Ala., S.C.)
Anthostoma gastrina (Fr.) Sacc., on *Carya ovata* **, on *Carya* sp. **
Anthostoma juglandinum Rehm., on twigs of *Carya tomentosa* (Ill.)
gale (N.Y.), on *Myrica pensylvanica* (N.J., N.Y.)
Camarops microspora (Karst.) Shear, on branches of *Ulmus americana* (Alaska, Idaho, N.Y.)
Ceriospora dubyi Niessl., on *Humulus lupulus* (Nebr.)
Clypeosphaeria ulmicola Ellis & Everh., on *Ulmus* sp. (Ontario)
Daldinia concentrica (Bolt.) Ces. & DeN., on *Hamamelis virginiana* (widespread), on *Maclura pomifera* (N.C.), on *Ulmus americana* (widespread)
Diatrype albopruinosa (Schw.) Cooke, on *Ulmus americana* **
Diatrype asterostoma Berk. & Curtis, on *Celtis occidentalis* **
Diatrype disciformis (Hoffm.) Fr., on *Ulmus rubra* **
Diatrype tumida Ellis & Everh., on *Ulmus rubra* (Kans., Ontario)
Diatrypella prominens (Howe) Ellis & Everh., on *Platanus occidentalis* **
Diatrypella quercina Pers., on *Morus rubra* (Ga.)
Diatrypella verrucaeformis (Ehrh.) Nitsch., on *Myrica pensylvanica* **, on *Myrica* sp. **
Discostroma corticola (Fekl.) Brockm., on old vines of *Humulus lupulus* **
Eutypa ludibunda Sacc., on *Carya glabra* **

Eutypella constellata (Berk. & Curtis) Ellis & Everh., on *Carya glabra* **
Eutypella deusta Ellis & Everh., on *Morus nigra* **
Eutypella fraxinicola (Cooke & Peck) Sacc., on *Ulmus rubra* (** Ga., Ind.)
Eutypella innumerabilis (Peck) Sacc. (= *Valsa innumerabilis* Peck), on branches of *Ulmus americana* **
Eutypella platani (Schw.) Sacc., on *Platanus occidentalis* **
Eutypella scoparia (Schw.) Ellis & Everh. (= *Eutypella longirostris* Peck), on *Ulmus americana* (widespread **), on *Ulmus pumila* (Ala., Ga., La.), on *Ulmus rubra* (Ga., Ind.)
Eutypella stellulata (Fr.) Sacc., on *Carya glabra* **, on *Ulmus americana* **, on *Ulmus pumila* (Ala., Ga., La.)
Eutypella tumida (Ellis & Everh.) Wehm., on *Ulmus americana* (widespread)
Eutypella sp., on *Platanus occidentalis* (Ga.)
Hypoxydon cohaerens (Pers.) Fr., on *Hamamelis virginiana* **
Hypoxydon fuscopurpureum (Schw.) Berk., on *Juglans nigra* (Ind.)
Hypoxydon perforatum Schw., on *Ulmus americana* **
Hypoxydon rubiginosum Pers., on *Carya* sp. (Ga.), on *Juglans* sp. (Ga.)
Hypoxydon sp., on *Platanus occidentalis* (Ga.)
Kretzschmaria deusta (= *Ustulina vulgaris* Tul.), on dead wood of *Carya glabra* **, *Morus* sp. **, on *Ulmus americana* (Md.)
Nummularia clypeus (Schw.) Cooke, on *Ulmus americana* (Midwest), on *Ulmus thomastii* (Ill.)
Nummularia discincola (Schw.) Cooke, on *Carya tomentosa* (Ga.)
Nummularia repanda (Fr.) Nits., on *Ulmus americana* (Midwest), on branches of *Ulmus rubra* (Del.)
Nummularia tinctor (Berk.) Ellis & Everh., on *Platanus occidentalis* (La.)
Rosellinia aquila (Fr.) DeN., on *Carya glabra* (N.Y. **), on *Juglans* sp. (Ind.), on *Morus rubra* (Ind.)
Rosellinia caespitosa Ellis & Everh., on dead branches of *Celtis occidentalis* (Kans.)
Rosellinia caryae Bonar (= *Dothichiza caryae* Bonar), on *Carya ovata* (Mich.)
Rosellinia millegrana (Schw.) Sacc., on *Carya glabra* **, on *Ulmus rubra* **
Rosellinia mutans (Cooke & Peck) Sacc., on *Juglans cinerea* **
Rosellinia pulveracea (Ehrl.) Fckl., on *Celtis* sp. (Miss.), on *Ulmus americana* **
Valsaria exasperans (Ger.) Ellis & Everh., on *Juglans cinerea* **
Valsaria insitiva Ces. & DeN., on branches of *Morus alba* (Md.)
Xylaria hypoxydon L., on *Ulmus americana* (widespread)
Xylaria multiplex Kuntze, on *Liquidambar styraciflua* (Ala., Ga.)
Xylaria persicaria (Schw.) Curtis, on *Liquidambar styraciflua* (Ga.)
Xylaria polymorpha Pers., on *Ulmus americana* (Ill., Miss., Va. **)

PHACIDIALES

Stictus radiata (L.) Pers., on bark of *Platanus occidentalis* **

PHYLLACHORALES

Glomerella cingulata (Ston.) Spauld. & Schrenk, on nuts of *Carya* spp. (Southern States), leaf spot on *Humulus lupulus* (Ind., Kans., Md., N.Y., Wash., Wisc.)
Ophiodothella leucospila (Berk. & Curtis) J.H. Miller, on fallen leaves on *Platanus occidentalis* (Ga.)
Phyllachora ulmi (Duv.) Fckl., on *Ulmus americana* **

HYPOCREALES

Gibberella baccata (Wallr.) Sacc., on twigs of *Morus* spp. (Iowa)
Gibberella saubinetii (Mont.) Sacc., on stems of *Cannabis sativa* (Ind., Va.), on nuts of *Carya* sp. (N.Y.)
Hypocrea lenta (Tode) Berk. & Br., on *Liquidambar styraciflua* (Ga.)
Hypocrea moriformis Cooke & Massee, on *Ulmus americana* **
Hypomyces cancri (Rutgers) Wr., on roots of *Cannabis sativa* (Md.)
Megalonectria pseudotrichia (Schw.) Berk. & Br., on *Carya* sp.
Nectria cinnabarina Tode, on twigs of *Broussonetia papyrifera* (Ala., N.Y.), on *Carya* spp. (widespread), on *Juglans* spp. (** widespread), on *Maclura pomifera* (Ind., N.M., N.Y.), on *Morus alba* (** widespread), on *Morus rubra* (N.Y.), on *Ulmus americana* (** widespread), on *Ulmus procera* (Mass., N.J., N.Y.), on *Ulmus pumila* (** widespread)

Nectria coccinea Pers., on branches of *Juglans* sp. (Conn., Oreg., Va.), on *Ulmus americana* (Mass., N.J., N.Y.), on *Ulmus rubra* (Mo.), on *Ulmus* sp. (Ontario)
Nectria coccinea Pers. var. *faginata* Lohman, Watson & Ayers, on *Carya* spp. (New England States)
Nectria ditissima Tul. ?, on *Juglans nigra* (widespread)
Nectria galligena Bres., on *Carya cordiformis* (N.Y., Pa.), on *Carya tomentosa* (N.Y., Pa.), on *Carya* sp. (widespread in the Eastern States), on *Juglans cinerea* (N.Y., Pa.), on *Juglans* sp. (Ind., N.C., Ohio, Pa., R.I., Va., W. Va.), on *Ulmus americana* (N.Y., Pa.)
Nectria verrucosa (Schw.) Sacc., on *Morus alba* (N.J., Pa., S.C.)
Nectria sp. (= *Nectria coccinea* ?), on *Morus alba* (widespread)
Nectria sp., on *Liquidambar styraciflua* (Ga.)
Nectria sp., on *Juglans regia* (N.Y.)
Pleonectria missouriensis (Ellis & Everh.) Sacc., on bark of *Carya* sp. (Del. to Mo.)
Thyronectria chlorinella (Cooke) Seeler, on *Ulmus americana* (Ala., N.C.)
Thyronectria chrysogramma Ellis & Everh., on *Ulmus americana* (Kans.)

TRICHOSPHERIALES

Ceratostomella pluriannulata Hedge., wood stain in *Liquidambar styraciflua* (Gulf States)
Ceratostomella ulmi Buis. (*Graphium ulmi* Schwartz), "Dutch Elm Disease", on *Ulmus americana* (widespread), on *Ulmus procera* (Conn., N.Y.), on *Ulmus pumila* (N.Y.), on *Ulmus rubra* (Ind., N.Y., Ohio), on *Ulmus thomasi* (Ind., N.Y., Ohio)

DOTHIDEALES

Acrospormoides subulata J.H. Miller & G.E. Thompson, on leaves of *Morus rubra* (Ga.)
Dothidea crystallophora Berk. & Curtis (= *Dothidea tetraspora* Berk. & Br.), on twigs of *Maclura pomifera* (Ill., N.J., N.Y.***, Pa.)
Mycosphaerella arachnoidea Wolf., false mildew on *Morus rubra* (Ga., N.C.)
Mycosphaerella caryigena (Ellis & Everh.) Demaree & Cole [= *Cercospora caryigena* (Ellis & Everh.) Hoehn., *Cylindrosporium caryigena* Ellis & Everh.], leaf spot on *Carya cordiformis* (Wisc.)
Mycosphaerella dendroides (Cooke) Demaree & Cole (= *Cercospora halstedii* Ellis & Everh.), leaf blotch on *Carya ovata* (Ga.), on *Carya tomentosa* (Southern States), on *Carya* sp. (Eastern & Southern States)
Mycosphaerella erysiphina (Berk. & Br.) Kirch., leaf spot on *Humulus lupulus* (Calif.)
Mycosphaerella maculiformis (Pers.) Schroet., on fallen leaves of *Celtis occidentalis* (Kans.)
Mycosphaerella mori (Fckl.) Wolf, on *Morus alba* (widespread), on *Morus rubra* (widespread)
Mycosphaerella myricae Miles, on *Myrica pensylvanica* (Ga., Miss.)
Mycosphaerella platanifolia (Cooke) Wolf, leaf spot on *Platanus occidentalis* (N.C. to Ga., Iowa, Tex.)
Mycosphaerella punctiformis (Pers.) Starb. [= *Mycosphaerella maculiformis* (Pers.) Schroet.], on fallen leaves of *Carya tomentosa* (cosmopolitan)
Mycosphaerella stigmata-platani Wolf, on living leaves of *Platanus occidentalis* (Kans., N.C., Tex.)
Mycosphaerella ulmi Kleb. [= *Phleospora ulmi* (Fr.) Wallr., *Cylindrosporium ulmicola* Ellis & Everh.], leaf spot of *Ulmus americana* (widespread), on *Ulmus procera* (Conn., N.Y.), on *Ulmus rubra* (widespread), on *Ulmus thomasi* (Ill., Miss., N.C., Tex.)
Mycosphaerella sp., on *Liquidambar styraciflua* (Ga.)
Mycosphaerella sp., on leaves of *Hamamelis virginiana* (W.Va.)
Neodeightonia ramulicola (Peck) Barr (= *Sphaeria ramulicola* Peck), on twigs of *Ulmus americana* **

PLEOSPORALES

Botryosphaeria graphidea (Berk. & Rav.) Sacc., on *Myrica pensylvanica* **
Botryosphaeria marconii (Cav.) Charles & Jenkins, stem canker and wilt of *Cannabis sativa* (Md., Va.)
Botryosphaeria obtusa (Schw.) Shoemaker, on *Hamamelis virginiana* (Mass.)
Botryosphaeria ribis (Tode) Gross. & Dug., on *Juglans cinerea* (Ga.), on *Juglans nigra* (Ga.), on *Liquidambar styraciflua* (Md. to Fla. and La.), on *Morus alba* (Ga., N.J.), on *Platanus occidentalis* (Fla., Pa.), canker on seedlings of *Ulmus americana* (Ga.), on *Ulmus pumila* (Ark.)
Didymella nucis-hicoriae Fairm., on nuts of *Carya* sp. (N.Y.)
Didymella sp., on *liquidambar styraciflua* (Ga.)

Leptosphaeria acuta (Moug.) Karst., on stems of *Urtica gracilis* (Calif.)
Leptosphaeria cacuminispora Fairm., on nuts of *Carya* sp. (N.Y.)
Leptosphaeria hamamelidis Fairm., on branches of *Hamamelis virginiana* (N.Y.)
Leptosphaeria myricae Dearn. & House, on twigs of *Myrica gale* (N.Y.**)
Leptosphaeria platanicola (Howe) Sacc., on *Platanus occidentalis* (Ga.)
Leptosphaeria sp., on *Myrica pensylvanica* (Ga.)
Metasphaeria humulina (Peck) Sacc., see *Discostroma corticola* (Xylariales)
Physalospora fusca N.E. Stevens, on *Carya* sp. (Ga.), on *Liquidambar styraciflua* (Southeastern States), on *Platanus occidentalis* (N.C.), on *Ulmus americana* (Ala.)
Physalospora obtusa (Schw.) Cooke, on *Broussonetia papyrifera* (Ala., Md., Okla.), on *Carya* sp. (Southern States), on *Celtis occidentalis* (widespread), on *Hamamelis virginiana* (widespread), on *Juglans* sp. (widespread), on *Liquidambar styraciflua* (Southern States), on *Maclura pomifera* (N.Y. to Ala., La., Kans.), on *Morus alba* (Eastern States), on *Platanus occidentalis* (Va. to La., Ga.), on *Ulmus americana* (Conn., Ga., Iowa, Kans.), on *Ulmus rubra* (Ga.)
Physalospora rhodina Berk. & Curtis, on branches of *Liquidambar styraciflua* (Southern States), on *Platanus occidentalis* (N.C.)
Teichospora chevalierii Karst., on *Myrica gale* **
Teichospora phellogena (Berk. & Curtis) Sacc., on bark of *Ulmus* sp.**

MELANOMMATALES

Asteromassaria minor (Peck) Barr (= *Caryospora minor* Peck), on pericarps of *Carya* sp. (cosmopolitan **)
Didymosphaeria celtidis Schw., on dead branches of *Celtis occidentalis* (Kans.)*
Didymosphaeria sp., on twigs of *Ulmus pumila* (Tex.)
Didymosphaeria superflua (Auers.) Niessl., on stems of *Urtica gracilis* (Calif., Mont.)
Fenestella amorphia Ellis & Everh., on *Carya* sp. **
Lophiosphaeria triseptata Peck, on *Juglans cinerea* **, on *Maclura pomifera* (Ontario)
Lophiosphaeria sp., on *Myrica gale* **
Lophiostoma caulinum (Fr.) Ces. & DeN., on *Platanus occidentalis* (Ga.)
Lophiostoma quadrinucleatum Karst. (= *Lophiostoma triseptata* Peck), on *Juglans cinerea* **
Massaria atroinquians Berk. & Curtis, on *Platanus occidentalis* **
Massaria epileuca Berk. & Curtis, on *Morus alba* (Ind., N.J., Pa.), on *Morus rubra* (** Ala.)
Massaria olivacea Cooke, on *Morus alba* (Md., Pa.), on *Morus rubra* (Miss.)
Massaria platani Ces., on twigs of *Platanus occidentalis* (Ga., Ind., Iowa, Kans. **)
Massaria plumigera Ellis & Everh., on dead *Hamamelis virginiana* **
Massaria seriata Cooke, on twigs of *Carya* sp. (S.C.)
Massaria myricae (Peck) Berl. (= *Metasphaeria myricae* Peck), on branches of *Myrica gale* **
Melanomma caryophagum (Schw.) Sacc., on nuts of *Carya* spp. (widespread)
Melanomma rhododendri Rehm., on *Myrica gale* **
Mycosphaerella sp. [= *Sphaerella maculaeformis* (Pers.) Awd.], on fallen leaves of *Carya glabra* **
Mycosphaerella sp. [= *Sphaerella pardalota* Cooke & Ellis], on dead leaves of *Myrica pensylvanica* **
Mycosphaerella sp. [= *Sphaerella punctiformis* (Pers.) Rabenh.], on *Platanus occidentalis* (S.C.)
Splanchnonema hickoria Barr, on branches of *Carya* spp. (Mass.)
Thyridaria comptoniae (Ellis & Everh.) Berl. & Vogl., on stems of *Comptonia peregrina* (N.J.)
Trematosphaeria nuclearia (DeN.) Sacc., on nuts of *Carya glabra* **, on nuts of *Carya* sp. **
Trematosphaeria pertusa (Pers.) Fckl., on dead wood of *Platanus occidentalis* **

LEOTIALES

Ascocoryne cylichnum (Tul.) Groves & Wilson, on *Ulmus americana* **
Calloria fusarioides (Berk.) Fr., on dead stems of *Urtica* sp. **
Ciboria acerina Whet. & Buchw., on catkins of *Myrica gale* (N.Y.)
Ciboria carunculoides (Siegl. & Jenkins) Whetzel, a berry hardening disease of *Morus alba* (N.C. to Fla. and Tex.)
Cistella grevillei (Berk.) P. Raschle [= *Tichopeziza urticina* (Peck) Sacc.], on *Laportea canadensis* **
Dermatea carnea Cooke & Ellis, on *Hamamelis virginiana* **
Dermatea hamamelidis (Peck) Groves [= *Patellaria hamamelidis* Peck, *Dermatella hamamelidis* (Peck) Durand], on bark of *Hamamelis virginiana* (** Pa., W.Va.)

Dermea mori Peck, on dead branches of *Morus alba* (Kans.)
Echinella rhabdocarpa (Ellis) Seaver, on *Comptonia peregrina* **
Incrucipula sulfurellum (Peck) Boral & Kriegelstein [= *Lachnum cruciferum* (Phill.) Nannf., *Dasyscyphys sulphureus* (Peck) Sacc.], on *Comptonia peregrina* **, on *Myrica gale* **
Karschia stygia (Berk. & Curtis) Massee, on dead wood of *Ulmus* sp. **
Lachnum niveum (Fr.) Karst., on *Juglans cinerea* **
Lachnum virgineus (Batsch: Fr.) Karst., on *Myrica gale* **, on *Myrica pensylvanica* **, on *Platanus occidentalis* **
Lecanidion atratum (Hedw.) Endl., on *Liquidambar styraciflua* **, on exposed wood of *Ulmus americana* **
Orbilbia piloboloides Haines & Egger, on *Ulmus americana* (Ontario)
Pezicula hamamelidis Groves & Singer, on *Hamamelis virginiana* **
Sclerotinia sclerotium (Lib.) Duby, stem rot and wilt of *Cannabis sativa* (Mont.), on *Humulus lupulus* (widespread)
Sclerotinia sp. [= ? *Sclerotinia sclerotiorum* (Lib.) DuB.], on *Morus alba* (Tex.)
Strossmayeria basitricha (Sacc.) Ed., on *Ulmus americana* **
Tapesia fusca (Pers.) Fckl., on *Myrica gale* **
Trichopeziza myricacea (Peck) Sacc., on *Myrica gale* **
Tryblidiella minor (Cooke) Sacc., on bark of living *Carya ovata* **
Tryblidiella nigrocinnabarina (Schw.) Rehm., on *Morus alba* (Ala.)
Tryblidiella rufula Spreng., on *Maclura pomifera* (Kans.)
Tryblidiella rufula Spreng. var. *microspora* Ellis & Everh., on branches of *Morus alba* (Kans.)
Unguicularia scrupulosa (Karst.) v. Hoehn., on *Ulmus americana* **

OSTROPALES

Acrospermum compressum Tode, on dead stems of *Urtica* sp. **
Acrospermum foliicolum Berk. on *Morus alba* (Ga.)

PEZIZALES

Sarcoscypha occidentalis Schw., on fallen branches of *Carya glabra* **
Scutellinia erinaceus (Schw.) Kuntz., on rotten *Carya* sp. **

MYRIANGIALES

Myriangium duriaei Mont. & Berk., on scale insects infesting *Liquidambar styraciflua* (widespread)

HYSTERIALES

Gloniopsis cookeana (Ger.) Sacc., on *Myrica* sp. **
Hysterium angustatum A. & S., on *Celtis occidentalis* **, on *Myrica pensylvanica* **
Hysterographium mori (Schw.) Rehm., on *Carya* sp. **, *Celtis occidentalis* **, on *Maclura pomifera* **, on *Morus rubra* (Ga.)

MICROTHYRIALES

Asterella myricae Miles, on leaves of *Myrica pensylvanica* (Miss.)
Dothidella ulmea (Schw.) Ellis & Everh., on *Ulmus rubra* **

UREDINALES

Aecidium boehmeriae Arth., 0, I on *Boehmeria cylindrica* (Ind., Md., N.Y.**)
Aecidium sp., rust on *Humulus lupulus* (Wash.)
Cronartium comptoniae Arth., II, III on *Comptonia peregrina* (Maine to Minn., N.C., and Ohio **), on *Myrica gale* (Maine to N.Y. **, and Va.). 0, I on hard pines and pitch pines.
Gymnosporangium ellisii (Berk.) Farl., 0, I on *Comptonia peregrina* (N.J.), on *Myrica gale* (** Maine), on *Myrica pensylvanica* (Mass. to N.Y. ** and Va.). III on *Chamaecyparis thyoides*.
Physopella fici (Cast.) Arth., II on *Maclura pomifera* (S.C. to Fla., Tex.), on *Morus rubra* (Tex.)

TREMELLALES

Exidia glandulosa Fr., on *Ulmus americana* **

AURICULARIALES

Helicobasidium purpureum (Tul.) Pat. [= perfect state of *Rhizoctonia crocorum* Pers. (Hyphomycetes), on *Morus alba* (Tex.)

SEPTOBASIDIALES

Septobasidium apiculatum Couch, on scale insects on *Liquidambar styraciflua* (Southern States)

Septobasidium burtii Lloyd, on scale insect on *Liquidambar styraciflua* (Southern States)

Septobasidium mariani Bres., on scale insects on *Liquidambar styraciflua* (Southern States)

Septobasidium pseudopedicellatum Burt, on scale insects on *Liquidambar styraciflua* (Southern States), on *Ulmus americana* (N.C.)

Septobasidium sinuosum Couch, on scale insects on *Liquidambar styraciflua* (Southern States)

Septobasidium rugulosum Couch, on scale insects on *Liquidambar styraciflua* (Fla.)

DACRYMYCETALES

Dacrymyces ellisii Coker, on *Hamamelis virginiana* **

Dacrymyces palmatus (Schw.) Bres., on *Ulmus americana* **

APHYLLOPHORALES

Aleurodiscus candidus (Schw.) Burt, on *Carya* sp. (Mo., Ohio, Pa.)

Aleurodiscus griseo-canus (Bres.) Hoehn. & Litsch., on bark of *Ulmus americana* (Iowa, Mo., N.Y.)

Aleurodiscus oakesii (Berk. & Curtis) Hoehn. & Litsch., on bark of *Ulmus americana* (Iowa, Mo., N.Y.)

Chondostereum purpureum (Pers.) Pouz. (= *Stereum purpureum* Pers.), on *Platanus occidentalis* (widespread), on *Ulmus americana* (widespread)

Climacodon pulcherrimus (Berk. & Curtis) Nikol, (= *Hydnum pulcherrimum* Berk. & Curtis) on *Liquidambar styraciflua* (Gulf States)

Climacodon septentrionale (Fr.) Karst. (= *Hydnum septentrionale* Fr.), on *Carya* spp. (widely distributed)

Coriolus biformis (Klotzsch) Pat. (= *Polyporus biformis* Klotzsch), on dead wood of *Carya* spp. (Lower Mississippi Valley), on *Juglans* sp. (N.Y.)

Coriolus hirsutus (Wulf.) Quel. (= *Polyporus hirsutus* Wulf.), on *Carya* spp., *Juglans* spp., *Liquidambar styraciflua* (nearly cosmopolitan), on *Ulmus americana* (Mo., N.Y.)

Coriolus versicolor (L.) Quel. (= *Polyporus versicolor* L.), on dead wood of *Juglans* spp., *Liquidambar styraciflua*, *Platanus occidentalis* (widespread), on *Ulmus americana* (** widespread)

Corticium stevensii Burt, on *Liquidambar styraciflua* (La.)

Daedalea ambigua Berk., on *Carya* spp. (Lower Mississippi Valley, Fla.)

Daedalea confragosa Bolt., on *Liquidambar styraciflua* (widespread), on *Ulmus americana* (widespread **), on *Ulmus thomasi* (Tenn.)

Daedalea elegans Spreng., on *Carya* spp. (Lower Mississippi Valley, Fla.)

Daedalea quercina L., on *Carya* spp. (Eastern States)

Daedalea unicolor Bull., on *Liquidambar styraciflua* (Tex.), on *Ulmus americana* (N.Y., Vt.)

Favolus alveolaris (DC.) Quel., on *Carya tomentosa* (N.Y.), on *Carya* sp. (Va., Vt.)

Fomes densus Lloyd, on *Carya* sp. (La., Miss.)

Fomes fraxineus Bull., on *Liquidambar styraciflua* (widespread), on *Ulmus americana* (widespread)

Fomes fraxinophilus (Peck) Cooke, on *Ulmus americana* **

Fomes geotropus Cooke, on *Ulmus americana* (Fla. to La. and Ark.)

Fomes marmoratus (Berk. & Curtis) Cooke, on *Carya* sp. (Lower Mississippi Valley), on *Liquidambar styraciflua* (widespread), on *Ulmus americana* (Tex.)

Fomitopsis pinicola (Swartz) Karst., on *Platanus occidentalis*

Fomitopsis scutellatus (Schw.) Bond & Singer, on *Hamamelis virginiana* (widespread), on *Platanus occidentalis* (Md.), on *Ulmus americana* (Va.)

Ganoderma appplanatum (Pers.) Pat., Artist's Conch, on *Carya* spp. (cosmopolitan), on *Liquidambar styraciflua* (widespread), on *Morus rubra* (widespread), on *Platanus occidentalis* (widespread), on *Ulmus americana* (widespread **)
Ganoderma curtisii (Berk.) Murr., on *Carya* spp. (Lower Mississippi Valley), on *Liquidambar styraciflua* (Southern States), on *Ulmus americana* (Southern States)
Ganoderma lucidum (Leyss.) Karst., on *Liquidambar styraciflua* (Southern States)
Ganoderma sessile Murr., on *Ulmus americana* (N.Y., Ohio)
Grifola frondosa (Dicks.) S.F. Gray (= *Polyporus frondosus* Dicks.), on *Ulmus americana* (Conn., Ohio)
Hericium erinaceus (Bull.) Pers., on *Liquidambar styraciflua* (Gulf States), on *Platanus occidentalis* (N.C.)
Hymenochaete agglutinans Ellis, on trunks and branches of *Hamamelis virginiana* (Va.), *Liquidambar styraciflua* (Md.), *Morus rubra* (Md.)
Inonotus cuticularis (Bull.) Karst. (= *Polyporus cuticularis* Bull.), on dead wood of *Liquidambar styraciflua* (widespread)
Inonotus hispidus (Bull.) Karst. (= *Polyporus hispidus* Bull.), on *Morus alba* (Conn.)
Irpex lacteus (Fr.) Fr. [= *Polyporus tulipiferus* (Schw.) Overh.], on *Celtis occidentalis* (Minn.), on *Ulmus americana* (N.Y.)
Ischnoderma resinosum (Schrad.) Karst. (= *Polyporus resinosus* Schrad.), on *Ulmus americana* (Maine, Va.)
Laxitextum bicolor (Pers.) Lentz (= *Stereum bicolor* Pers.), on *Platanus occidentalis* (widespread)
Lenzites betulina (L.) Fr., on *Ulmus americana* (Ind., Mass., Md.)
Lopharia cinerascens (Schw.) G.H. Cunningham [= *Stereum cinerascens* (Schw.) Mass.], on *Morus alba*, on *Ulmus americana* (Mass.)
Oxyporus latemarginatus (Durieu & Mont.) Donk (= *Poria ambigua* Bres.), on *Carya* spp. (Southern States), on *Liquidambar styraciflua* (widely distributed)
Oxyporus populinus (Schum.) Donk. (= *Fomes connatus* (Fr.) Gill.), on *Ulmus americana* (New England States), on *Ulmus rubra* (Conn., Mass.)
Phellinus conchatus (Pers.) Quel., on *Juglans* sp. (N.Y.)
Phellinus everhartii (Ellis & Gall.) Pilat, on *Ulmus rubra* (W.Va.)
Phellinus gilvus (Schw.) Pat. [= *Polyporus gilvus* (Schw.) Fr.], on dead wood on *Juglans* spp. (widespread), on *Liquidambar styraciflua* (widespread), on *Morus rubra* (Ala.), on *Platanus occidentalis* (widespread), on *Ulmus americana* (N.Y., Wisc.), on *Ulmus pumila* (Okla.)
Phellinus igniarius (L.) Quel., on *Carya* spp. (cosmopolitan), on *Juglans nigra* (Okla.), on *Juglans* sp. (widespread), on *Ulmus americana* (New England States, Wisc.), on *Ulmus thomasi* (Tenn.)
Polyporus admirabilis Peck, on *Juglans* sp. **, on *Ulmus americana* (N.Y.)
Polyporus adustus Willd., on *Carya* spp. (cosmopolitan), on *Juglans* spp. (cosmopolitan), on *Liquidambar styraciflua* (widespread), on *Platanus occidentalis* (cosmopolitan), on *Ulmus americana* (widespread)
Polyporus biennis (Bull.) Fr. (= *Polyporus distortus* Schw.), on dead wood of *Carya* spp. (Lower Mississippi Valley)
Polyporus conchifer (Schw.) Fr., on *Ulmus americana* (widespread)
Polyporus dichrous Fr., on *Liquidambar styraciflua* (widespread)
Polyporus dryadeus Pers., on *Ulmus americana* (N.Y.)
Polyporus farlowii Lloyd, on *Morus alba* (Ariz., Calif., N.M.)
Polyporus fissilis Berk. & Curtis, on dead wood of *Carya* sp. (Fla.), on *Liquidambar styraciflua* (Lower Mississippi Valley)
Polyporus fragans Peck, on *Ulmus americana* (N.Y.)
Polyporus fumosus Pers., on *Ulmus americana* (Mass., N.Y., Wisc.)
Polyporus hydroides (Schw.) Fr., on dead wood of *Carya* sp., on *Liquidambar styraciflua* (Lower Mississippi Valley)
Polyporus lacteus Fr., on *Platanus occidentalis*, on *Ulmus americana* (N.Y.)
Polyporus pargamenus Fr., on dead wood of *Liquidambar styraciflua* (cosmopolitan)
Polyporus rhipidium Berk., on *Liquidambar styraciflua*
Polyporus rigidus Lev., on *Liquidambar styraciflua*, *Platanus occidentalis* (Mississippi Valley)
Polyporus schweinitzii Fr., on *Liquidambar styraciflua*
Polyporus sector Ehr., on dead wood of *Carya* spp. and *Liquidambar styraciflua* (Lower Mississippi Valley)
Polyporus semipileatus Peck, on *Hamamelis virginiana* **
Polyporus spraguei Berk. & Curtis, on *Liquidambar styraciflua* (widespread)
Polyporus squamosus Micheli, on *Ulmus americana* (** Northeastern and North Central States)
Polyporus subcypus (Murr.) Lloyd, on *Liquidambar styraciflua*
Polyporus sulphureus Bull., on *Juglans* spp. (widespread), on *Ulmus americana* (widespread)
Polyporus supinus Schw., on dead wood of *Carya* spp., *Liquidambar styraciflua* (Lower Mississippi Valley)
Polyporus zonalis Berk., on dead wood of *Carya* spp., *Liquidambar styraciflua* (Lower Mississippi Valley)
Poria canescens Karst., perhaps on *Carya* sp., on *Liquidambar styraciflua*

Poria earlei (Murr.) Sacc. & Trott., on *Liquidambar styraciflua*
Poria ferruginosa (Schröd.) Karst., on *Liquidambar styraciflua* and *Maclura pomifera* (widespread)
Poria flaccida Overh., on *Liquidambar styraciflua*
Poria langloisiana Murr., on *Liquidambar styraciflua*
Poria medulla-panis (Jacq.) Bres. [= *Fomes unita* (Pers.) Lowe], on *Carya* sp. (Ind., Mich), on *Ulmus americana* (Mich.)
Poria nigrescens Bres., on *Liquidambar styraciflua*
Poria pulchella (Schw.) Cooke, on *Juglans* sp. (Md., N.Y.)
Poria punctata (Fr.) Cooke, on *Juglans* sp., *Liquidambar styraciflua* (Ohio, Pa., Vt.), on *Maclura pomifera* (widespread)
Poria spiculosa Campbell & Davidson, on *Carya* spp. (Pa. to N.C., W.Va.)
Poria versipora (Pers.) Romell, on *Juglans* sp. (Mich.), on *Liquidambar styraciflua* (widespread)
Pycnoporus cinnabarinus (Jacq.) Karst. (= *Polyporus cinnabarinus* Jacq.), on *Juglans* sp. (widely distributed)
Pycnoporus sanguineus (L.) Murr. (= *Polyporus sanguineus* L.), on *Liquidambar styraciflua*, *Platanus occidentalis*
Schizophyllum commune Fr., on *Carya* spp. (widespread), on *Juglans nigra* (cosmopolitan), on *Juglans regia* (Calif.), on
Liquidambar styraciflua (widespread), on *Ulmus americana* (cosmopolitan), on *Ulmus pumila* (Calif.)
Solenia ochracea Hoffm. (= *Henningsomyces* sp. ?), on *Carya* sp. (Mass.)
Spongipellis delectans (Peck) Murr. (= *Polyporus delectans* Peck), on dead wood of *Carya* sp. (N.Y.), on *Juglans* sp. (N.Y.),
on *Ulmus americana* (N.Y.)
Spongipellis galactinus (Berk.) Pat. (= *Polyporus galactinus* Berk.), on *Liquidambar styraciflua*, on *Platanus occidentalis*,
on *Ulmus americana* (Maine, N.Y.)
Spongipellis spumeus (Sow.) Pat. (= *Polyporus spumeus* Sow.), on *Juglans* sp. (N.Y.), on *Ulmus americana* (N.Y., Ohio)
Steccherinum ochraceum Pers., on *Liquidambar styraciflua* (Gulf States)
Stereum hirsutum (Willd.) S.F. Gray, on *Carya* sp. (Ind., N.Y.)
Stereum ostrea (Blume & Nees) Fr. (= *Stereum fasciatum* Schw.), on *Juglans nigra* (Okla.), on *Liquidambar styraciflua*
(widely distributed), on *Platanus occidentalis* (Okla.), on *Ulmus americana* (Okla.)
Stereum subpileatum Berk. & Curtis, on *Liquidambar styraciflua* (Gulf States), on *Ulmus americana* (Southern States)
Thelephora retiformis Berk. & Curtis, see *Septobasidium burtii* (*Septobasidiales*)
Trametes malicola Berk. & Curtis, on *Carya* sp.
Trametes mollis (Sommerf.) Fr., on *Carya* sp. (N.Y.)
Trametes serpens Murr. (= *Trametes rigida* Berk. & Mont.), on *Carya* sp. (Lower Mississippi Valley), on *Liquidambar styraciflua* (Southern States)
Trametes variiformis Peck, on *Hamamelis virginiana* (Panama)

AGARICALES

Armillariella mellea (Vahl.) Karst. (= *Armillaria mellea* Vahl.), on *Carya* sp. (Calif.), on *Celtis occidentalis* (Oreg., Wash.),
on *Humulus lupulus* (Oreg.), on *Juglans regia* (Calif., N.C., N.J., Tex.), on *Platanus occidentalis* (Md., Tex., W. Va.), on
Ulmus americana (Mo.)
Armillariella tabescens (Scop.) Sing. [= *Clitocybe tabescens* (Scop.) Bres.], root rot of *Liquidambar styraciflua* (Fla.)
Clitocybe parasitica E.M. Wilcox, root rot of *Carya tomentosa* (Okla.)
Flammulina velutipes (Fr.) Karst., heart rot and wound rot of *Ulmus americana* (widespread)
Lentinus lepideus Fr., wood rot in *Liquidambar styraciflua* (widespread)
Lentinus tigrinus (Bull.) Fr., heart rot in *Liquidambar styraciflua* after fire damage (La., Miss.)
Marasmius nucicola McDougall, on nuts of *Carya* sp. (Ill.)
Marasmius sp., on living bark of *Ulmus americana* (widespread)
Panus laevis Berk. & Curtis, wound rot in *Liquidambar styraciflua* (Ga.)
Pleurotus dryinus (Pers.) Kummer (= *Pleurotus corticatus* Fr.), sapwood rot of *Carya* sp. (Ark.), of *Liquidambar styraciflua*
(La., Miss.)
Pleurotus ostreatus (Jacq.) Kummer, on *Celtis occidentalis* (Southern States), on *Liquidambar styraciflua* (La., Miss.), on
Ulmus americana (widespread)
Pleurotus ulmarius (Bull.) Kummer, on *Ulmus americana* (widespread)
Tubaria ferruginosa (Batsch.) J.F. Gmelin, on dead fallen limb of *Ulmus americana* **

HYPHOMYCETES

- Alternaria antennaeforme* (Berk. & Curtis) Ellis (= *Macrosporium antennaeforme* Berk. & Curtis), on *Celtis occidentalis* (Mo., Tex., W.Va.)
- Alternaria* sp., mold on nuts of *Juglans regia* (Calif.)
- Articularia quercina* (Peck) Hoehn., on leaves of *Carya tomentosa*
- Botrytis cinerea* Pers., * gray mold on *Cannabis sativa* (Oreg., Va.), on *Humulus lupulus* (widespread), on stems of *Maclura pomifera* (Oreg.)
- Ceratophorum ulmicola* Ellis & Kellerm., leaf spot on *Ulmus rubra* (Kans., Nebr.)
- Ceratophorum uncinatum* (Clinton & Peck) Sacc., on leaves of *Carya cordiformis* (Kans., Mo.), on *Carya tomentosa* (Fla.), on *Carya* sp. (Ark., Kans., Mo.)
- Cercospora boehmeriae* Peck, leaf spot on *Boehmeria cylindrica* (Ala., N.C., Nebr., N.Y.** , Pa., Tenn., Wisc.)
- Cercospora halstedii* Ellis & Everh., conidial state of *Mycosphaerella dendroides*, leaf blotch on *Carya* spp. (Eastern and Southern States)
- Cercospora hamamelidis* Ellis & Everh., on leaves of *Hamamelis virginiana* (** Fla.)
- Cercospora juglandis* Kell. & Swing, leaf spot on *Juglans cinerea* (Mass.), on *Juglans nigra* (Kans.)
- Cercospora liquidambaris* Cooke & Ellis (nomen nudum?), leaf spot on *Liquidambar styraciflua* (Md. to Fla., Tex.)
- Cercospora maclurae* Ellis & Everh., leaf spot on *Maclura pomifera* (Ala.)
- Cercospora platanicola* Ellis & Everh. (conidial state of *Mycosphaerella platanifolia* (Dothideales), on *Platanus occidentalis* (N.C. to Ga., Tex., Iowa)
- Cercospora pulvinulata* Sacc. & Wint., on *Morus rubra* (Kans., Mo., Nebr., Tex.)
- Cercospora spegazzinii* Sacc., on leaves of *Celtis occidentalis* (Iowa)
- Cercospora sphaeriaeformis* Cooke, leaf spot on *Ulmus americana* (La., Tex.)
- Cercospora tuberculans* Ellis & Everh., on *Liquidambar styraciflua* (Fla., La., Miss., Mo.)
- Cercospora* sp., leaf spot on *Humulus lupulus* (Nebr.)
- Cercospora arachnoidea* Wolf, see *Mycosphaerella arachnoidea* (Dothideales)
- Cercospora caryigena* (Ellis & Everh.) Hoehn., see *Mycosphaerella caryigena* (Dothideales)
- Cercospora celtidis* (Ellis & Kell.) J.J. Davis (= *Ramularia celtidis* Ellis & Everh.), leaf spot on *Celtis occidentalis* (Central States to Tex.)
- Cercospora maculans* (Bereng.) Wolf (conidial state of *Mycosphaerella mori* (Dothideales)
- Cercospora mori* Peck, leaf spot on *Broussonetia papyrifera* (N.C.), on *Morus alba* (Nebr., Okla., Tex.)
- Chalaropsis thielavioides* Peyronel, seedling root rot of *Ulmus pumila* (widespread)
- Cladosporium effusum* (Wint.) Demaree, on *Carya cordiformis* (Kans., Wisc.), on *Carya tomentosa* (Ill., Kans.), on *Carya* sp. (widespread)
- Cladosporium herbarum* Lk., on dead stems of *Urtica* sp. **
- Cladosporium pericarpum* Cooke, on nuts of *Juglans nigra* (S.C.)
- Cladosporium* sp., on *Juglans nigra* (Minn.)
- Coniosporium nucifoedum* Fairm., on nuts of *Carya* sp. (N.Y.)
- Dendrodochium sepultum* Ellis & Everh., on *Morus rubra* **
- Exosporina faugetti* E.E. Wilson, branch wilt and canker on *Juglans regia* (Calif.)
- Exosporium liquidambaris* Tharp., leaf spot on *Liquidambar styraciflua* (Tex.)
- Exosporium platanorum* Tharp., on leaves of *Platanus occidentalis* (Tex.)
- Exosporium* sp., on *Morus rubra* (Fla.)
- Fumago vagans* Pers., sooty mold on strobiles of *Humulus lupulus* (Calif., Oreg., Wash.)
- Fusarium carpineum* J.J. Davis, leaf spot on *Carya cordiformis* (Wisc.)
- Fusarium lateritium* Nees, on nuts of *Juglans regia* (Conn., N.Y.), occasionally on other species of *Juglans*, on *Morus alba* (widespread)
- Fusarium moniliforme* Sheldon, on *Liquidambar styraciflua* (Southern States)
- Fusarium oxysporum* Schlecht., on *Ulmus americana* (Conn., Ill., Mass.)
- Fusarium roseum* Lk., on nuts of *Carya* sp. (N.Y.)
- Fusarium scirpi* Lamb. & Fautr. var. *compactum* Wr., on *Ulmus americana* (Conn., Ill., Mass.)
- Fusarium semitectum* Berk. & Rav. var. *majus* Wr., on nuts and twigs of *Juglans* spp. (widespread but uncommon)
- Fusarium solani* (Mart.) Appel. & Wr., on *Liquidambar styraciflua* (Southern States)
- Fusarium* sp., canker and stem rot of *Cannabis sativa* (Ill., Ind., Va., Wisc.), perhaps the conidial state of *Gibberella saubinetii* (Hypocreales)

Fusicladium effusum Wint., see *Cladosporium effusum*
Fusisporium nectroides Berk. & Curtis, on dead *Ulmus americana* (Mass.)
Gonatobotryum maculicola (Wint.) Sacc., leaf spot on *Hamamelis virginiana* (** N.H. to W. Va., Fla. and Wisc.)
Graphium hamamelidis Van Hook, leaf spot on *Hamamelis virginiana* (N.Y. to Ind. and Tenn.)
Graphium rigidum (Pers.) Sacc., wood stain of *Liquidambar styraciflua* (Southern States)
Graphium rubrum Rumbold, wood stain of *Liquidambar styraciflua* (Southern States)
Gyrocera divergens Peck, on leaves of *Celtis occidentalis* (Kans.)
Haplographium apiculatum Peck, on leaves and leaf galls of *Hamamelis virginiana* (N.Y.**)
Harpographium fasciculatum Sacc., on branches of *Carya* sp. (La.)
Helicobasidium purpureum Pat. (= *Rhizoctonia crocorum* Pers.), on roots of *Ulmus americana* (Tex.)
Helicoceras celtidis (Biv.-Bernh.) Linder, on leaves of *Celtis occidentalis* (Ark., Kans., Mo.)
Helminthosporium molle Berk. & Curtis, on *Liquidambar styraciflua* (S.C.)
Helminthosporium urticae Peck, on stems of *Urtica gracilis* (N.D., N.Y.**, Tex.)
Helminthosporium sp., on *Comptonia peregrina* **
Ovularia destructiva (Phill. & Plowr.) Mass. (= *Ramularia destructiva* Phill. & Plowr.), on *Comptonia peregrina* (Wisc.), on *Myrica gale* (New England, Wisc., Alaska)
Ovularia maclurae Ellis & Langl., cottony leaf spot on *Maclura pomifera* (Ala., La., Tex.)
Ovularia monilioides Ellis & G. Martin, on *Myrica gale* (** Maine, Mass.)
Penicillium spp., green mold of *Liquidambar styraciflua* timber (widespread)
Phymatotrichum omnivorum (Shear) Dug., root rot on *Broussonetia papyrifera* (Tex.), on *Cannabis sativa* (Ariz., Tex.), on *Ulmus americana* (Tex.), on *Ulmus pumila* (Ariz., Okla., Tex.), on *Ulmus thomasi* (Tex.)
Ramularia albomaculata Peck, on leaves of *Carya* sp. **
Ramularia destructiva Phill. & Plowr. see *Ovularia destructiva*
Ramularia hamamelidis Peck, leaf spot on *Hamamelis virginiana* (N.Y.** to W. Va., Okla., and Wisc.)
Ramularia monilioides Ellis & G. Martin, on *Myrica gale* (N.Y.**)
Ramularia parietariae Pass., leaf spot on *Parietaria pensylvanica* (Mo.)
Ramularia urticae Ces., leaf spot on *Urtica dioica* (** Wyo.), on *Urtica gracilis* (Vt. to Tex., Calif., Wash.)
Rhinotrichum curtisii Berk., on *Platanus occidentalis* (Ohio)
Rhizoctonia crocorum Pers., see *Helicobasidium purpureum*
Rhizoctonia solani Kuehn, seedling blight, of *Maclura pomifera* (Nebr.), on *Ulmus americana* (widespread), on *Ulmus pumila* (widespread)
Sclerotium rolfsii Sacc., blight of *Cannabis sativa* (S.C., Tex.), of seedlings of *Juglans nigra* (Tex.)
Septonema breviusculum Berk. & Curtis, on *Carya glabra*
Septonema spilomeum Berk., on *Juglans cinerea* (Vt.)
Septonema sp. on *Myrica gale* **
Sporidesmium maclurae Thum., leaf blight of *Maclura pomifera* (Mo., S.C., Tex.)
Sporocybe byssoides Fr., on *Urtica dioica* **
Stigmata platani (Fekl.) Sacc., conidial state of *Mycosphaerella stigmata-platani* (Dothideales)
Stilbum giganteum Peck [= *Graphium giganteum* (Peck) Sacc.], on log of *Ulmus* sp. (Ontario)
Stilbum sp., on bark of *Ulmus americana* **
Streptothrix atra Berk. & Curtis, on twigs of *Hamamelis virginiana* **
Strumella coryneoides Sacc. & Wint., branch and trunk canker on *Carya* sp. (Pa.)
Tuiolella curvata (Peck) Hughes [= *Torula curvata* Peck, *Hormiscium curvatum* (Peck) Sacc.], on dead branches of *Myrica gale* **
Thyrostroma compactum (Sacc.) Hoehn., canker on trunk of *Ulmus pumila* (Ill.)
Torula ligniperda (Willd.) Sacc., red heartwood stain in *Liquidambar styraciflua* (widespread)
Trichoderma viride Pers., on stumps of *Ulmus americana* **
Trichothecium roseum Lk., pink mold on nuts of *Carya* spp. (cosmopolitan), on *Juglans nigra* **, on *Ulmus americana* **
Tripasporium juglandis Thum., on *Juglans nigra* (S.C.)
Tripasporium ravenelii Farlow, on *Platanus occidentalis* (S.C.)
Tubercularia nigricans (Bull.) Link, on dead twigs of *Ulmus pumila* (Md., N.Dak.)
Tubercularia ulmea Carter, canker on *Ulmus pumila* (Ill.)
Tubercularia vulgaris Tode, on *Platanus occidentalis* **, on *Ulmus pumila* **
Verticillium albo-atrum Reinke & Berth., on *Humulus lupulus* (Maine, Ohio, Oreg., Wisc.), on *Ulmus procera* (Conn., Mass., N.J., N.Y.), on *Ulmus rubra* (Pa., Wisc.)

Verticillium rhizophagum Tehon, on roots of *Ulmus americana* (Ohio)
Verticillium sp., wilt of *Maclura pomifera* (Conn.)
Verticillium sp. (? = *Verticillium albo-atrum* Reinke & Berth.), on *Ulmus americana* (widespread)
Volutella caryogena Fairm., on nuts of *Carya* sp. (N.Y.)

SPHAEROPSIDALES

Actinopelte dryina (Sacc.) Hoehn, leaf spot on *Carya ovata* (Ill.), on leaves of *Ulmus thomasi* (Ill.)
Actinothecium juglandis Dearn. & House, on *Juglans cinerea* (N.Y.)
Ascochyta juglandis Bolts., ring spot on *Juglans regia* (Oreg., Wash.)
Camarosporium celtidis Ellis & Everh., on branches of *Celtis occidentalis* (Kans.)
Cicinobolus cesatii DBy., on *Parietaria pensylvanica* **
Coniothyrium caryogenum Rand, on leaves of *Carya tomentosa* (Ill.)
Coniothyrium radiculicola Tehon, in roots of *Ulmus americana* (Ohio)
Coniothyrium ulmi Tharp, leaf spot on *Ulmus procera* (Tex.), on *Ulmus pumila* (W.Va.)
Coniothyrium sp., twig canker on *Ulmus americana* (Ill., Mass., Mich., Wisc.)
Cytospora albiceps Ellis & Everh., on branches of *Juglans nigra* (Kans.)
Cytospora ambiens Sacc., on dead twigs of *Ulmus americana* (widespread)
Cytospora carbonacea Fr., on *Ulmus americana* (Mass., Tex.) The conidial state of *Cryptosporella hypodermia* (*Sphaeriales*)
Cytospora caryigena Ellis & Everh., on branches of *Carya* sp. (Va., W.Va.)
Cytospora celtidis Ellis & Everh., on branches of *Celtis occidentalis* (Kans., W.Va.)
Cytospora chrysosperma Pers., on *Ulmus americana* (Minn.) The conidial state of *Valsa sordida* (*Sphaeriales*)
Cytospora intermedia Sacc., on *Carya glabra* **
Cytospora leucosperma (Pers.) Fr., on *Platanus occidentalis* **
Cytospora macluriae Ellis & Barth., see *Valsa macluriae* (*Sphaeriales*)
Cytospora platani Fekl., on twigs of *Platanus occidentalis* (Maine to Va., Tex. Iowa)
Cytospora sp., on *Morus* spp. (widespread)
Cytospora sp. (= ? *Cytospora chrysosperma* Pers.), on *Ulmus pumila* (N.Dak. to Tex. and Oreg.)
Cytosporina ludibunda Sacc., twig canker on *Ulmus americana* (Ill., Kans.)
Dendrophoma longipes (Berk. & Curtis) Grove, on branches of *Morus alba* (Kans., Mass., N.Y.), on *Morus rubra* (S.C.)
Deuterophoma ulmi (Verall & May) Goid. & Ruggieri, see *Dothiorella ulmi* (*Dothideales*)
Dichomera juglandis Ellis & Everh., on dead branches of *Juglans* sp. (Ohio)
Dinemasporium decipiens Sacc., on dead twigs of *Celtis occidentalis* (Kans., Pa.), on *Ulmus* sp. (Kans.)
Dinemasporium radiatum Ellis & Everh., on dead twigs of *Celtis occidentalis* (Kans., Pa.)
Dinemasporium robiniae Ger., on wood of *Ulmus americana* **
Diplodia celtidigena Ellis & Barth., on dead branches of *Celtis occidentalis* (Kans., Mo.)
Diplodia hamamelidis Fairm., on branches of *Hamamelis virginiana* (N.Y.)
Diplodia juglandis Fr., on branches of *Juglans* spp. (widespread)
Diplodia melaena Lev. (= *Diplodia ulmi* Fekl.), on dead sprouts of *Ulmus americana* **
Diplodia mori Berk. & Curtis, on twigs of *Morus* sp. **
Diplodia natalensis P. Evans, on *Liquidambar styraciflua* (Gulf States)
Diplodia sp., on *Myrica gale* (N.J.)
Discosia maculicola Ger., on *Hamamelis virginiana* **
Discosia rugulosa Berk. & Cooke, see *Gnomonia caryae* (*Sphaeriales*)
Dothiorella berengeriana Sacc., bleeding necrosis of *Liquidambar styraciflua* (N.J., N.Y.)
Dothiorella celtidis Peck, on dead twigs of *Celtis occidentalis* (N.Y.**)
Dothiorella gregaria Sacc., dieback of *Juglans regia* (Calif.)
Dothiorella hicoloriae Dearn. & House, on twigs of *Carya tomentosa* (N.Y.)
Dothiorella mori Berl. [= ? *Botryosphaeria ribis* (*Pleosporales*)], on twigs of *Morus alba* (N.J., Tex.)
Dothiorella nucis Fairm., on nuts of *Carya* sp. (N.Y.)
Dothiorella ulmi Verall & May, on *Ulmus americana* (widespread), on *Ulmus rubra* (widespread), the perfect state of *Deuterophoma ulmi* (*Sphaeropsidales*)
Dothiorella sp., on *Platanus* × *hybrida* (N.Y.)
Gloeodes pomigena (Schw.) Colby, on branches of *Platanus occidentalis* (Ind.), on *Ulmus rubra* (Ind.)
Haplosporella celtidis Ellis & Everh., on branches of *Celtis occidentalis* (W.Va.)
Haplosporella commixta Peck, on bark of dead branches of *Ulmus rubra* (Kans.)

Haplosporella juglandis Ellis & Barth., see *Physalospora obtusa* (Pleosporales)
Haplosporella lathamii Dearn., on dead twigs of *Myrica pensylvanica* (N.Y.)
Hendersonia celtidis Ellis & Everh., on dead twigs of *Celtis occidentalis* (Pa., Ill., N.J.)
Hendersonia celtifolia Cooke, on leaves of *Celtis occidentalis*
Hendersonia davisii Ellis & Everh., leaf spot of *Carya tomentosa* (Wisc.)
Hendersonia desmazieri Mont., on *Platanus occidentalis* **
Hendersonia foliorum Fckl., var. *hamamelidina* Fairm., on leaves of *Hamamelis virginiana* (N.Y.)
Hendersonia pustulata Ellis & Everh., on nuts of *Carya* sp. (N.J., N.Y.)
Leptothyriella liquidambaris Tehon & Stout, red leaf spot on *Liquidambar styraciflua* (Ill., Md., N.C.)
Leptothyrium caryae (Ellis & Everh.) Cole, see *Gnomonia caryae* (Sphaeriales)
Leptothyrium dryinum Sacc., see *Actinopelte dryina*
Macrophoma celtidicola Dearn. & House, on *Celtis occidentalis* (Mo., Nebr.)
Macrophoma ulmicola Ellis & Everh., on dead branches of *Ulmus americana* **
Macrophomina phaseoli (Maubl.) Ashby, on *Cannabis sativa* (Ill.)
Macropodia juglandicola Dearn. & House, see *Physalospora obtusa* (Pleosporales)
Mastigosporella hyalina (Ellis & Everh.) v. Hoehn., on *Comptonia peregrina* **
Melasmia ulmicola Berk. & Curtis, on leaves of *Ulmus americana* (N.J.)
Phleospora celtidis Ellis & Morg., leaf spot on *Celtis occidentalis* (Mass. to Mo., and Kans.)
Phleospora maculans (Bereng.) Allesch., the conidial state of *Mycosphaerella mori* (Dothideales)
Phleospora mori (Lev.) Sacc., the conidial state of *Mycosphaerella mori* (Dothideales)
Phleospora moricola (Pass.) Sacc., leaf spot on *Morus rubra* (Ind., Md., S.C.)
Phleospora multumaculans Heald & Wolf, leaf spot on *Juglans* spp. (Tex.), on *Platanus occidentalis* (Ind., Tex.)
Phleospora ulmi (Fr.) Wallr., on *Ulmus americana* (Ill., Miss., N.C., Tex.), on *Ulmus montana* **, on *Ulmus rubra* **, the conidial state of *Mycosphaerella ulmi* (Dothideales)
Phoma cincta Berk. & Curtis, on leaves of *Ulmus americana* (S.C.)
Phoma exocarpina Peck, on nuts of *Carya* sp. (N.Y.)
Phoma glandicola (Schw.) Cooke, see *Physalophora glandicola* (Pleosporales)
Phoma herbarum West. forma *urticae* Sacc., on stems of *Urtica* sp. **
Phoma juglandina Sacc., on *Juglans regia* **
Phoma longipes Berk. & Curtis, on *Morus alba* **
Phoma sp., on twigs of *Ulmus americana* (Ill.)
Phomopsis cannabina Curzi, on stems of *Cannabis sativa* (Ill.)
Phomopsis juglandina (Fckl.) Hoehn., on twigs of *Juglans* sp. (Calif.)
Phomopsis oblonga (Desm.) Hoehn., see *Diaporthe eres* (Sphaeriales)
Phomopsis scabra (Sacc.) Trav., conidial state of *Diaporthe eres* (Sphaeriales), on twigs of *Platanus occidentalis* (Ohio, Okla., W.Va.)
Phomopsis sp., on *Carya* sp. (Eastern States)
Phomopsis sp., (widespread), perhaps the conidial state of *Diaporthe eres* (Sphaeriales)
Phomopsis sp., on twigs of *Ulmus pumila* (Wisc.)
Phyllosticta boehmericola J.J. Davis, on *Boehmeria cylindrica* (Wisc.)
Phyllosticta caryae Peck, leaf spot on *Carya ovata* (** widespread), on *Carya tomentosa* (Fla., N.Y., Wisc.), on *Carya* sp. (Tex.)
Phyllosticta celtidis Ellis & Kell., leaf spot on *Celtis occidentalis* (widespread)
Phyllosticta confertissima Ellis & Everh., leaf spot on *Ulmus americana* (Pa.), on *Ulmus rubra* (Kans.)
Phyllosticta convexula Bub., leaf spot on *Carya glabra* (Va.), on *Carya tomentosa* (Mo.), on *Carya* sp. (widespread)
Phyllosticta decidua Ellis & Kell., leaf spot on *Humulus lupulus* (Iowa, Wisc.)
Phyllosticta erratica Ellis & Everh., on *Ulmus americana* (Ala., Tex.), on *Ulmus rubra* (Ala.)
Phyllosticta hamamelidis (Cooke) G. Martin, leaf spot on *Hamamelis virginiana* (** Conn. to Miss., Tenn., and Wisc.)
Phyllosticta humuli Sacc. & Speg., leaf spot on *Humulus lupulus* (Iowa, Mass., Mich.)
Phyllosticta humuli Sacc. & Speg. var. *major* Ellis & Everh., leaf spot on *Humulus lupulus* (Iowa)
Phyllosticta juglandina Sacc., on leaves of *Juglans regia* (Oreg.)
Phyllosticta juglandis (DC.) Sacc., on *Juglans regia* (Ga., Ind., Oreg., Wash.)
Phyllosticta macluriae Ellis & Everh., leaf spot on *Maclura pomifera* (Mo., N.J.)
Phyllosticta melaleuca Ellis & Everh., on *Ulmus americana* (widespread), on *Ulmus procera* (Vt.), on *Ulmus rubra* (Ind., Mich., W.Va.), on *Ulmus thomasi* (Miss., Wisc.)

Phyllosticta moricola Ellis & Everh., leaf spot on *Morus rubra* (Kans., S.C.)
Phyllosticta myricae Cooke, leaf spot on *Myrica pensylvanica* (N.Y. **)
Phyllosticta paviae Ellis & Everh., on *Hamamelis virginiana* (Ill.)
Phyllosticta platani Sacc. & Speg., leaf spot on *Platanus occidentalis* (Ala., Kans., Mass., Md., Va.)
Phyllosticta subtilis Peck, leaf spot on *Carya* sp. (widespread)
Phyllosticta sp., on *Hamamelis virginiana* (Okla.)
Phyllosticta sp., leaf spot on *Ulmus pumila* (N.J.)
Piggotia asteroidea Berk. & Br., on *Ulmus americana* **
Placosphaeria celtidis Dearn. & House, on twigs of *Celtis occidentalis* (N.Y. **)
Pyrenochaeta nucinata Fairm., on nuts of *Carya* sp. (N.Y.)
Rhabdospora juglandis (Schw.) Sacc., on branches of *Juglans nigra* (Pa.)
Sacidium ulmi-gallae Kell. & Swingle, on leaf galls of *Ulmus americana* (Kans., Tex., Wisc.), on *Ulmus pumila* (Tex.), on *Ulmus rubra* (Wisc.)
Septoria angustissima Peck on leaves of *Maclura pomifera* (Miss.)
Septoria cannabis (Lasch) Sacc., leaf spot on *Cannabis sativa* (Md. to Ky., Iowa, and Minn.; Fla., Tex.)
Septoria carpogena Ellis & Everh., on *Celtis occidentalis* **
Septoria caryae Ellis & Everh., leaf spot on *Carya ovata* (Mich.), on *Carya* sp. (Del.)
Septoria celtis-gallae Gerard, on *Celtis occidentalis* **
Septoria hamamelidis Peck, on *Hamamelis virginiana* **
Septoria hickoriae Tharp., leaf spot on *Carya cordiformis* (Tex.), on *Carya* sp. (Tex.)
Septoria humuli West., leaf spot on *Humulus lupulus* (N.H.)
Septoria liquidambaris Cooke & Ellis, leaf spot on *Liquidambar styraciflua* (Mass. to Fla., Tex.)
Septoria lupulina Ellis & Kell., on *Humulus lupulus* (Kans.)
Septoria mori Lev., the conidial state of *Mycosphaerella mori* (*Dothideales*)
Septoria myricata Dearn. & House, leaf spot on *Myrica gale* (N.Y.**)
Septoria parietariae J.J. Davis, leaf spot on *Parietaria pensylvanica* (Iowa, Wisc.)
Septoria pileae Thum., leaf spot on *Pilea pumila* (Ill., Ind., Iowa, Mich., Mo., N.Y. **, Wisc.)
Septoria platanifolia Cooke, leaf spot on *Platanus occidentalis* (Ga., Iowa, Md., S.C., Tex., W.Va.)
Septoria tenuissima Wint., leaf spot on *Boehmeria cylindrica* (Kans., Mo.)
Septoria urticae Rob., leaf spot on *Laportea canadensis* **, on *Parietaria canadensis* (Wisc.), on *Urtica gracilis* (Ill., Minn., Mont., S.D., Tex., Wisc., Wyo.)
Sphaeronema nitidum Berk. & Curtis, on *Celtis occidentalis* (Ill.)
Sphaeropsis celtidis Ellis & Everh., on dead branches of *Celtis occidentalis* (** Kans.)
Sphaeropsis druparum (Schw.) Cooke, on nuts of *Juglans nigra* (Pa.)
Sphaeropsis gallae (Schw.) Berk. & Curtis, on *Carya* galls **, see *Physalospora glandicola* (*Pleosporales*)
Sphaeropsis hamamelidicola Dearn. & House, on *Hamamelis virginiana* **
Sphaeropsis hypodermia (Sacc.) Hoehn., on twigs of *Ulmus americana* (widespread), on *Ulmus procera* (Pa.), on *Ulmus pumila* (Conn.)
Sphaeropsis juglandis Ellis & Barth., see *Physalospora obtusa* (*Pleosporales*)
Sphaeropsis juglandicola Dearn. & House, on *Juglans cinerea* **
Sphaeropsis linearis Peck (= *Sphaeropsis caryae* Cooke & Ellis), on *Carya cordiformis* **, on *Carya glabra* **, on *Carya ovata* **, on *Carya tomentosa* **
Sphaeropsis liquidambaris Dearn. & House (= *Physalospora obtusa* ?), on branches of *Liquidambar styraciflua* (N.Y.**)
Sphaeropsis maclurae Cooke, ** see *Physalospora obtusa* (*Pleosporales*)
Sphaeropsis pallidula Fairm., on nuts of *Carya* spp. (widespread)
Sphaeropsis pericarpi (Schw.) Ellis & Everh., on nuts of *Carya glabra* **, on nuts of *Carya* spp. (widespread)
Sphaeropsis platani Peck, on *Platanus occidentalis* **
Sphaeropsis sepulta Ellis & Everh., on branches of *Morus alba* (Conn., Kans., N.Y.**), on *Morus rubra* **
Stagonospora humuli-americanum Fairm., on *Humulus lupulus* (N.M.)
Stagonospora linearis Peck, on branches of *Carya* sp. (Ill.)

MELANCONIALES

Colletotrichum dematium (Pers.) Groves, on dead stems of *Boehmeria cylindrica* **
Colletotrichum sp., on *Humulus lupulus* see *Glomerella cingulata* (*Sphaeriales*)
Coryneum tumoricola Peck, leaf spot on *Ulmus americana* (N.Y.)
Cryptostictus consocia (Peck) Guba [= *Pestalozzia consocia* Peck, *Monochaetia consocia* (Peck) Sacc.], on leaves of *Hamamelis virginiana* **

Cryptostictus insidens (Zab.) Gub., on *Ulmus* sp. **
Cylindrosporium caryigenum Ellis & Everh., see *Mycosphaerella caryigena* (Dothideales)
Cylindrosporium defoliatum Heald & Wolf, leaf blight of *Celtis occidentalis* (Tex.)
Cylindrosporium humuli Ellis & Everh., on *Humulus lupulus* (N.Y. to N.C., Iowa, and Wisc.)
Cylindrosporium juglandis Wolf., leaf spot on *Juglans nigra* (Ala., Okla., Tenn.), on *Juglans regia* (Ala., N.C.)
Cylindrosporium mori Berl., the conidial state of *Mycosphaerella mori* (Dothideales)
Cylindrosporium ulmicola Ellis & Everh., the conidial state of *Mycosphaerella ulmi* (Dothideales)
Cylindrosporium tenuisporium Heald & Wolf, leaf spot on *Ulmus thomasii* (Tex.)
Cylindrosporium ulmicola Ellis & Everh., see *Mycosphaerella ulmi* (Dothideales)
Cylindrosporium sp., leaf spot on *Cannabis sativa* (Md.)
Cylindrosporium sp., leaf spot on *Juglans cinerea* (Minn.)
Discula platani (Peck) Sacc., on *Platanus occidentalis* **, on *Platanus* × *hybrida* **
Gloeosporium caryae Ellis & Dearn., the conidial state of *Gnomonia caryae* (Sphaeriales), on *Carya cordiformis* **, on *Carya glabra* **, on *Carya ovata* **
Gloeosporium celtidis Ellis & Everh., on *Celtis occidentalis* (Nebr.)
Gloeosporium hamamelidis Cooke, see *Phyllosticta hamamelidis* (Sphaeropsidales)
Gloeosporium inconspicuum Cav., leaf spot on *Ulmus americana* (widespread), on *Ulmus procera* (Mass.)
Gloeosporium nervisequum (Fckl.) Sacc., on leaves of *Liquidambar styraciflua* (Miss., Tex.), on *Platanus occidentalis* **, perhaps the conidial state of *Gnomonia venetra* (Sacc. & Speg.) Klab. (Sphaeriales)
Gloeosporium platani (Mont.) Oud., on *Platanus occidentalis* **
Gloeosporium ulmeum Miles, see *Gnomonia ulmea* (Sphaeriales)
Gloeosporium ulmicola Miles, leaf spot on *Ulmus americana* (Conn., Ill., Ind., Wisc.), on *Ulmus pumila* (Conn., Ga., Kans., Tenn., Tex.), on *Ulmus rubra* (N.Y.)
Libertella sp., on branches of *Platanus occidentalis* (La.)
Libertella sp., canker on branches of *Ulmus pumila* (Colo.)
Marssonina juglandis (Lib.) Magn., [= *Marssonina juglandis* (Lib.) Magn., conidial stage of *Gnomonia leptostyla* (Sphaeriales)], leaf spot on *Carya* sp. (N.J. and N.C. to Iowa), on *Juglans cinerea* **, on *Juglans nigra* **
Melanconium angustatum Ellis & Everh., on *Carya* spp. (widespread)
Melanconium bicolor Nees, on *Carya* spp. (widespread)
Melanconium celtidis Ellis & Everh., on dead branches of *Celtis occidentalis* (Kans.)
Melanconium gracile Ellis & Everh., on *Carya* spp. (widespread)
Melanconium intermedium Peck, on *Carya ovata* **, on *Carya* sp. **, on *Juglans nigra* **
Melanconium magnum (Grev.) Berk., on *Carya* spp. (widespread)
Melanconium oblongum Berk. & Curtis, see also *Melanconis juglandis* (Sphaeriales), on *Juglans cinerea* **
Melanconium pallidum Peck, on *Carya cordiformis* (Ohio, W.Va.), on *Carya* sp. (widespread)
Microstroma brachysporium (Sacc.) Vest., on *Juglans cinerea* (widely distributed)
Microstroma juglandis (Bereng.) Sacc., on *Carya cordiformis* (** Wisc.), on *Carya glabra* (widespread), on *Carya ovata* **, on *Carya tomentosa* (widespread), on *Juglans cinerea* **, on *Juglans* spp. (widespread)
Microstroma leucosporium Niessl., on *Carya ovata* **, on *Juglans cinerea* **
Monochaetia desmazierii Sacc., leaf spot on *Carya glabra* (Md.), on *Carya ovata* (Tenn.), on *Carya tomentosa* (Tenn.), on *Carya* sp. (Md. to N.C. and Tenn.), on *Hamamelis virginiana* (Va. to Ga. and Tenn.), on *Ulmus thomasii* (Ga.)
Myxosporium diedickei Syd., twig blight of *Morus alba* (Tex., Wash.)
Myxosporium hymenuloides (Sacc.) Hoehn., on twigs of *Ulmus pumila* (Okla.)
Myxosporium luteum Ellis & Everh., on bark of *Carya* sp. (W.Va.)
Myxosporium platanicola Ellis & Everh., on branches of *Platanus occidentalis* (W.Va.)
Myxosporium ulmi (Oud.) Sacc., on branches of *Celtis occidentalis* (Tex.)
Neobarclaya flagellifera (Ellis & Everh.) Sacc. (= *Polynema* ?, = *Pestalotia flagellifera* Ellis & Everh., = the conidial state of *Cryptodiaporthe aubertii* var. *comptoniae* (Sphaeriales), on *Comptonia peregrina* (widespread)
Pestalotia nucicola Ellis & Everh., on nuts of *Carya* sp. (N.J., N.Y.)
Septogloeum celtidis Dearn., leaf spot on *Celtis occidentalis* (N.Y.)
Septogloeum mori Lev.) Briosi & Cav., the conidial state of *Mycosphaerella mori* (Dothideales)
Septogloeum parasiticum Kauffm. & Dearn., twig blight on *Ulmus americana* (Mich.)
Septogloeum profusum (Ellis & Everh.) Sacc., leaf blight on *Ulmus americana* (Ill., Miss.), on *Ulmus thomasii* (Ala.), perhaps the conidial state of *Mycosphaerella ulmi* (Dothideales)
Septogloeum ulmi Peck, on leaves of *Ulmus americana* **, the conidial stage of *Mycosphaerella ulmi* (Dothideales)

APPENDIX II

A List of Some Insects Associated with Plant Species in this Treatment.

by J. Kenneth Dean

THYSANOPTERA

Liothrips caryae (Fitch), in *Phylloxera* galls on *Carya*
Neothrips corticis Hood, under *Carya* bark
Scolothrips sexmaculatus (Pergrand), predacious on mites on *Ulmus*
Trichothrips flavicauda Morgan, under *Ulmus* bark

ORTHOPTERA

Hesperotettix brevipennis Thomas, among *Comptonia peregrina* plants
Oecanthus niveus DeG., Stoney Tree Cricket, on *Myrica pensylvanica*
Pseudopomala brachyptera Scudder, often in clumps of *Myrica pensylvanica*

HEMIPTERA

Coreidae

Leptoglossus oppositus Say, on *Morus*

Tingidae

Corythucha celtidis Osborn & Drake, Hackberry Lacebug, on *Celtis occidentalis*
Corythucha ciliata (Say), Sycamore Lacebug, on *Platanus*
Corythucha heidemanni Drake, on *Ulmus americana* and *Ulmus rubra*
Corythucha juglandis (Fitch), Walnut Lace Bug, on *Juglans cinerea*, *Juglans nigra*
Corythucha pergandei Heidemann, on *Ulmus*
Corythucha ulmi Osborn & Drake, Elm Lace Bug, on *Ulmus americanus*

Miridae

Ceratocapsus fasciatus (Uhler), on *Carya* sp.
Ceratocapsus nigellus Knight, on *Carya* sp.
Deraeocoris aphidophagus Knight, on *Ulmus*
Deraeocoris grandis (Uhler), on *Carya* sp.
Deraeocoris nitenatus Knight, on *Ulmus*
Diaphnidia capitata Van Duzee, on *Hamamelis virginiana*
Diaphnidia pellucida Uhler, on *Juglans nigra*, and *Ulmus* sp.
Eurychilopterella luridula Reuter, on *Ulmus*
Eustictus venatorius Van Duzee, on *Carya* sp.
Lophidea heidemanni Knight, on *Ulmus*
Lophidea reuteri Knight, on *Hamamelis virginiana*
Microphylellus longirostris Knight, on *Carya ovata*
Microphylellus modestus Reuter, on *Carya* sp. and *Ulmus* sp.
Neolygus caryae Knight, on *Carya ovata*
Neolygus invitus (Say), on *Carya* sp. and *Ulmus americana*
Neolygus queralbae Knight, on *Carya ovata*
Orthotylus ramus Knight, on *Carya* sp.
Paracalocoris hawleyi Knight, on *Humulus lupulus*
Paracalocoris scrupus (Say), on *Carya* sp.
Phytocoris caryae Knight, on *Carya* sp.
Phytocoris conspurcatus Knight, on *Juglans nigra* and *Ulmus* sp.
Phytocoris cortitectus Knight, on *Ulmus*
Phytocoris infuscatus Reuter, on *Carya* sp.
Phytocoris onustus Van Duzee, on *Carya* sp.
Phytocoris sulcatus Knight, on *Ulmus*

Plagiognathus albatrus (Van Duzee), Sycamore Plant Bug, on *Juglans cinerea*, *Juglans nigra*, *Platanus occidentalis*
Plagiognathus caryae Knight, on *Carya ovata*
Plagiognathus dispar Knight, on *Carya* sp.
Plagiognathus flavicornis Knight, on *Myrica gale*
Plagiognathus politus Uhler, on *Carya*
Plagiognathus punctatipes Knight, on *Juglans nigra*
Plagiognathus repletus Knight, on *Juglans cinerea* and *Juglans nigra*
Reuteria irrorata (Say), on *Ulmus americana*

HOMOPTERA

Membracidae

Carynota mera Say, on *Carya* and *Juglans cinerea*
Ceresa diceros Say, on *Juglans cinerea*
Ceresa taurina Fitch, on *Carya* and *Hamamelis virginiana*
Enchenopa binotata Say, on *Carya*, *Juglans cinerea*, *Juglans nigra*
Microcentrus caryae Fitch, on *Carya*
Stictocephala bubalus (Fab.), Buffalo Tree Hopper, on *Carya ovata*, *Juglans cinerea*, and *Ulmus*
Telamona tristis Fitch, on *Hamamelis virginiana*
Telamona unicolor Fitch, on *Juglans cinerea*, and *Juglans nigra*

Cicadellidae

Alebra albostriella (Fallen), on *Carya*, *Ulmus*
Edwardsiana rosae (L.), on *Ulmus*
Macropsis fumipennis (G.&B.), on *Ulmus*
Metcalfia pruinosa (Say), on *Carya*, *Ulmus*

Chermidae

Pachypsylla celtidis-gemma Riley, Hackberry Bud Gall, on *Celtis occidentalis*
Pachypsylla celtidis-mamma Riley, Hackberry Nipple-gall, on *Celtis occidentalis*
Pachypsylla celtidis-vesicula Riley, Hackberry Blister Gall, on *Celtis occidentalis*

Aphidae

Cepegillettea myricae (Patch), on *Comptonia peregrina*, *Myrica pensylvanica*
Cepegillettea sp., on *Myrica gale*
Chromaphis juglandicola (Kaltenb.), on *Juglans regia*
Colopha ulmicola (Fitch), Elm Cockscorn Gall, on *Ulmus americana*, *Ulmus rubra*
Drepanosiphum platanoides (Schränk), on *Platanus occidentalis*
Eriosoma americanum (Riley), Elm Leaf Curl Aphid, on *Ulmus americana*
Eriosoma crataegi (Oestlund), on *Ulmus*
Eriosoma lanigerum (Hausmann), Wooley Apple Aphid, on *Ulmus americana*
Eriosoma rileyi (Thos.), on *Ulmus*
Eriosoma ulmi (L.), on *Ulmus americana*
Georgiaphis ulmi Wilson, on *Ulmus rubra*, and *Ulmus thomasi*
Gobaishia ulmifusa (Walsh & Riley), Gall Aphid, on *Ulmus*
Hamamelistes spinosus Shimer, Spring Witch-hazel Bud Gall, on *Hamamelis virginiana*
Hormaphis hamamelidis (Fitch), Witch-hazel Leaf Gall Aphid, on *Hamamelis virginiana*
Longistigma caryae (Harris), Giant Bark Aphid, on *Carya*, *Juglans*
Melanocallis caryaefoliae (Davis), on *Carya cordiformis*, and *Carya ovalis*
Monellia costalis (Fitch), on *Carya cordiformis*, *Carya glabra*, *Carya ovata*, and *Juglans nigra*
Monellia hispida Quedn., on *Carya ovata*
Monellia microsetosa Richards, on *Carya glabra*
Monelliopsis caryae (Monell), on *Carya cordiformis*, *Carya ovata*, and *Juglans nigra*
Monelliopsis nigropunctata (Granovs.), on *Carya cordiformis*, *Carya ovata*, *Carya tomentosa*, *Carya* sp., and *Juglans nigra*
Monelliopsis sp., on *Carya cordiformis*
Myzocallis ulmifolii (Monell), on *Ulmus americana*, and *Ulmus thomasi*
Myzus persicae (Sulzer), Green Peach Aphid, on *Juglans*

Protopterocallis canadensis Richards, on *Carya cordiformis*, *Carya glabra*, *Carya ovata*
Tetraneura graminis Monell, on *Ulmus* sp.
Tetraneura ulmisaccula Patch, Elm Sac Gall, on *Ulmus*
Tinocallis caryaefoliae (Davis), on *Carya*
Tinocallis ulmifolia (Monell), on *Ulmus americana*
 Phylloxeridae
Phylloxera caryaecaulis Fitch, Hickory-gall Aphid, on *Carya*
Phylloxera caryae-fallax Fitch, on *Carya*
Phylloxera caryaefolia Fitch, on *Carya glabra*
Phylloxera caryaeglobuli Walsh, on *Carya*
Phylloxera caryae-venae Fitch, on *Carya*
 Coccidae
Aspidiotus ancylus Putnam, Putnam's Scale, on *Ulmus*, *Maclura pomifera*
Aspidiotus juglans-regiae Comstock, Walnut Scale, on *Carya*, *Celtis occidentalis*, *Hamamelis virginiana*, *Liquidambar styraciflua*
Aspidiotus ostreaeformis Curt., European Fruit Scale, on *Ulmus*
Aspidiotus perniciosus Comstock, San Jose Scale, on *Maclura pomifera*, *Ulmus*
Chionaspis americana Johnson, White Elm Scale, on *Ulmus*
Chionaspis furfura (Fitch), Elm Scurfy Scale, on *Celtis occidentalis*, *Ulmus*
Cryptophyllaspis liquidambaris Kot., Sweetgum Scale, on *Liquidambar styraciflua*
Eriococcus azaleae Comstock, on *Celtis occidentalis*
Gossyparia spuria (Modeer), European Elm Scale, on *Ulmus*
Icerya purchasi Mask., Cottony-cushion Scale, on *Carya*, *Celtis occidentalis*, *Juglans*, *Liquidambar styraciflua*
Lecanium caryae Fitch, the Hickory Lecanium, on *Carya*, *Celtis occidentalis*, *Juglans*, *Morus* spp., *Platanus occidentalis*, *Ulmus* spp.
Lecanium cerasorum (Cockerell), Calico Scale, on *Juglans regia*, *Liquidambar styraciflua*, *Ulmus* spp.
Lecanium corni Bouche, European Fruit Lecanium, on *Carya*, *Morus*, *Platanus*, *Ulmus*
Lecanium nigrofasciatum Pergande, the Terrapin Scale, on *Morus* spp., *Platanus occidentalis*
Lecanium querciflex Fitch, on *Carya*, *Ulmus*
Lepidosaphes ulmi (L.), Oystershell Scale, on *Juglans cinerea*, *Juglans nigra*, *Platanus occidentalis*, *Ulmus*
Pseudococcus comstockii (Kuwana), Comstock Mealybug, on *Morus*, *Ulmus*
Pulvinaria innumeralis (Rathvon), Cottony Maple Scale, on *Celtis occidentalis*, *Liquidambar styraciflua*, *Maclura pomifera*, *Morus* spp., *Platanus occidentalis*, *Ulmus* spp.
Quadraspidotus juglans-regiae (Comstock), Walnut Scale, on *Ulmus*
Saissetia oleae (Bern.), Black Scale, on *Platanus occidentalis* (Nursery stock)

COLEOPTERA

Mordellidae

Mordella marginata Melsh., on *Carya* sp.
Mordella octopuncta Fabr., on *Carya* sp.

Buprestidae

Acmaeodera tubulus Fabr., larva in *Carya* sp.
Actenodes acornis Say, larva in *Carya* sp.
Agrilus arcuatus Say, larva in *Carya* sp.
Agrilus egenus Gory, larva in *Carya* sp.
Agrilus fallax Say, larva in *Celtis occidentalis*
Agrilus lateralis Say, larva in *Comptonia peregrina*, *Myrica pensylvanica*
Agrilus lecontei Saunders, larva in *Celtis occidentalis*
Agrilus obsoletoguttatus Gray, larva in *Carya* sp.
Agrilus otiosus Say, larva in *Carya* sp., *Juglans cinerea*, *Juglans nigra*
Anthaxia viridicornis Say, larva in *Carya*, *Ulmus*
Brachys aerosus Melsh., Leaf Miner, on *Ulmus*

Buprestis rufipes Oliv., larva in *Carya* sp., *Ulmus americana*
Chrysobothris femorata Olivier, Flatheaded Apple Tree Borer, on *Platanus occidentalis*
Chrysobothris sexsignata Say, larva in *Carya*, *Juglans cinerea*, *Juglans nigra*
Dicerca divaricata Say, larva in *Ulmus americana*
Dicerca lurida Fabr., larva in *Carya* sp.
Dicerca pugnata Germ., larva in *Hamamelis virginiana*
Xenorhipis brendeli Leconte, larva in *Carya* sp.

Ostomidae

Tenebroides americanus Kby., in dying *Carya* sp.

Bostrichidae

Bostrichus bicornis Web., on *Ulmus* sp.
Lichenophanes truncaticollis Leconte, in *Carya* sp.
Xylobiops basillare Say, in *Carya* sp.

Lyctidae

Lyctus parallelopipedus Melsh., in *Juglans nigra* lumber
Lyctus basillare Say, destroying shovel handles (*Carya* sp. ?)

Cisidae

Cis creberrima Mell., in dead *Carya* sp.

Scarabeidae

Hoplia trifasciata Say, on buds of *Carya* sp.
Phyllophaga spp., June Bugs, on *Carya*
Popillia japonica Newm., Japanese Beetle, on *Platanus occidentalis*, *Ulmus*

Lucanidae

Ceruchus piceus Weber, larva in decaying *Juglans cinerea*, *Ulmus*

Cerambycidae

Batyle suturalis suturalis (Say), on *Carya*
Bellamira scalaris (Say), on *Carya*
Brachyleptura rubrica (Say), on *Carya*
Brachyleptura vagans (Oliver), on *Carya*, *Juglans*
Centrodera decolorata (Harris), on *Juglans*
Chion cinctus Drury, larva in *Carya*, *Juglans nigra*
Clytus ruricola (Oliver), on *Carya*
Clytoleptus albofasciatus (Castelnau & Gory), on *Carya*
Cyrtophorus verrucosus (Oliver), on *Carya glabra*, *Juglans nigra*
Distenia undata Fabr., on *Carya* sp., *Ulmus* sp.
Eburia quadrigeminata (Say), on *Carya*
Elaphidion mucronatum (Say), on *Celtis occidentalis*, *Juglans*, *Myrica*
Elaphidionoides aspersus (Haldeman), on *Carya glabra*
Elaphidionoides incertus (Newman), on *Carya glabra*
Elaphidionoides parallelus (Newman), on *Carya*, *Juglans*
Elaphidionoides villosus (Fabr.), Oak Tree Pruner, on *Carya*, *Hamamelis virginiana*, *Juglans*, *Ulmus*
Encyclops caerulea (Say), on *Carya*, *Juglans*
Eudermes picipes picipes, on *Carya glabra*, *Carya* sp., *Celtis occidentalis*, *Juglans nigra*, *Ulmus*
Eutetrappa tridentata (Oliver), Elm Borer, on *Ulmus*
Gaurotes cynipennis (Say), in wood of *Juglans* sp.
Heterachthes pallidus Haldeman, on *Carya glabra*, *Carya ovata*
Hypermallus incertus Newman, on *Carya* sp.
Knulliana cincta cincta (Drury), on *Carya glabra*, *Carya* sp., *Celtis occidentalis*, *Juglans*
Leptorhabdium pictum (Haldeman), on *Carya*
Leptura emarginata Fabr., on *Ulmus*
Megacyllene caryae (Gahan), on *Carya cordiformis*, *Carya ovata*, *Carya* sp., *Celtis occidentalis*, *Juglans cinerea*,
Juglans nigra, *Ulmus*
Microclytus gazellula (Haldeman), on *Carya glabra*
Molorchus bimaculatus bimaculatus Say, on *Carya*, *Hamamelis virginiana*, *Juglans cinerea*, *Juglans nigra*
Molorchus bimaculatus celti Knoll, on *Celtis occidentalis*

Neoclytus acuminatus acuminatus (Fabr.), Redheaded Ash Borer, on *Carya*, *Celtis occidentalis*, *Juglans*, *Ulmus*
Neoclytus capera (Say), on *Carya*, *Ulmus*
Neoclytus mucronatus mucronatus (Fabr.), on *Carya*
Neoclytus scutellaris (Oliver), on *Carya*, *Ulmus*
Oberea tripunctata (Swederus)
Oncideres cingulata Say, Twig Girdler, on *Carya*, *Celtis*, *Ulmus*
Orthosoma brunneum (Forster), on *Carya*, *Juglans*
Parandra brunnea Fabr., Brown Wood Borer, in *Ulmus americana*
Penichroa fasciata (Stephens), on *Carya*
Phymatodes testaceus (L.), on *Carya*
Physocnemum brevilineum (Say), on *Ulmus*
Psyrassa pertenuis (Casey), on *Carya* sp.
Psyrassa unicolor (Randall), on *Carya glabra*, *Juglans nigra*
Purpuricenus axillaris Haldeman, on *Carya glabra*, *Carya* sp.
Saperda discoidea Fabr., Hickory Saperda, in *Carya*, *Juglans*
Saperda lateralis Fabr., larva in *Carya*, *Ulmus*
Saperda tridentata Oliv., Elm Borer, in *Ulmus*
Sarosethes fulminans (Fabr.), on *Juglans cinerea*
Smodicum cucujiforme (Say), on *Celtis occidentalis*, *Ulmus*
Stenosphenus notatus Oliver, on *Carya glabra*, *Celtis occidentalis*
Strangalepta pubera (Say), on *Juglans*, *Ulmus*
Strangalia leteicornis (Fabr.), on *Ulmus*, on flowers of *Celtis occidentalis*
Strophionia niteus (Forster), on *Carya*, *Juglans*
Tessaropa tenuipes (Haldeman), larva in twigs of *Carya*, *Juglans nigra*
Thigonarthris proxima (Say), on *Carya*, *Hamamelis virginiana*
Tilloclytus germinatus (Haldeman), on *Carya tomentosa*
Trachysida mutabilis (Newman), on *Carya*, *Ulmus*
Trigonarthris minnesotana (Casey), on *Carya*, *Ulmus*
Tylonotus bimaculatus Haldeman, larva in *Carya*, *Juglans nigra*, *Ulmus*
Typocerus velutinus velutinus (Oliver), on *Carya*
Xylotrechus colonus (Fabr.), on *Carya*, *Juglans*, *Ulmus*

Chrysomelidae

Babia quadriguttata Oliver, on *Carya* sp.
Calligrapha scalaris Leconte, on *Ulmus*
Colaspis favosa Say, on *Myrica pensylvanica*
Pyrhalta luteola Muller, Elm Leaf Beetle, on all species of *Ulmus*

Platystomidae

Eusphyrus walshii Leconte, on *Carya* sp.

Belidae

Ithycerus noveboracensis Forst., the New York Weevil, on *Carya* sp.

Curculionidae

Apion herculanum Sm., on *Hamamelis virginiana*
Auletes ater Leconte, on *Comptonia peregrina*, *Myrica pensylvanica*
Balaninus caryae Horn., the Hickory-nut Weevil, on *Carya*
Conotrachelus anaglypticus Say, on *Carya* sp., *Ulmus rubra*
Conotrachelus elegans Say, on *Carya glabra*
Conotrachelus juglandis Leconte, Butternut Curculio, on *Juglans cinerea*, *Juglans nigra*
Conotrachelus retentus Say, Walnut Curculio, on *Juglans*
Conotrachelus seniculus Leconte, on *Carya* sp.
Cossonus platalea Say, on *Juglans cinerea*
Cryptorhynchus fallax Leconte, on *Carya* sp.
Cyrtepidomus castaneus (Roelofs), Asiatic Oak Weevil, on *Carya*, *Liquidambar*, *Plantanus*
Eugnamptus angustatus Hbst., on leaves of *Carya* sp.
Magdalis barbicornis Latr., on *Ulmus* sp.
Magdalis inconspicua Horn., on *Juglans nigra*
Magdalis olya Hbst., on *Carya* sp.

Magdalis pandurata Say, on *Carya* sp., *Juglans nigra*, *Ulmus* sp.
Phyllobius oblongus L., on *Ulmus americana*
Pseudanthrenomus hamamelidis Pierce, on *Hamamelis virginiana*
Sciaphilus muricatus Fabr., under decayed twigs of *Carya* sp.

Scolytidae

Chramesus hicoriae LeConte, on *Carya*
Hylurgopinus rufipes (Eichhoff), European Elm Bark Beetle, on *Ulmus americana*, *Ulmus rubra*
Phloeotribus liminaris (Harris), Peach Bark Beetle, on *Ulmus*
Phthorophloeus frontalis Oliv., on *Morus*
Scolytus multistriatus (Marshall), Elm Bark Beetle, on *Ulmus americana*, *Ulmus rubra*
Scolytus rugulosus Ratz., Shothole Borer, on *Morus*, *Ulmus*
Scolytus quadrispinosus Say, Hickory Bark Beetle, on *Carya*
Xyleborus celsus Eich., in dying *Carya* sp.

LEPIDOPTERA

Nepticulidae

Nepticula obscurella Braun, on *Myrica pensylvanica*
Nepticula ulmella Braun, on *Ulmus rubra*, *Ulmus thomasi*

Eucleidae

Cochlidion y-inversa Packard, on *Carya*

Psychidae

Thyridopteryx ephemeraeformis (Haworth), Bagworm, on *Liquidambar styraciflua*, *Platanus occidentalis*, *Ulmus*

Lyonetiidae

Bucculatrix packardella Chambers, on *Ulmus*
Philonome clemensella Chambers, on *Carya*

Gracilariidae

Gracilaria flavella Ely, on *Myrica pensylvanica*
Gracilaria superbifrontella Clem., on *Hamamelis virginiana*
Lithocolletis argentinotella Clemens, on *Ulmus*
Lithocolletis picturatella, on *Myrica pensylvanica*
Lithocolletis ulmella Chambers, on *Ulmus*

Coleophoridae

Coleophora caryaefolia Clemens, Hickory Cigar Case Bearer, on *Carya*
Coleophora caraefoliella Clemens, Pecan Cigar Case Bearer, on *Carya*
Coleophora laticornella Clemens, on *Carya*
Coleophora limosipennella Duponchel, Elm Case Bearer, on *Carya*, *Ulmus*
Coleophora ulmifoliella McDunnough, Elm Case Bearer, on *Ulmus*

Oecophoridae

Agonopteryx walsinghamella Busck, on *Myrica*

Gelechiidae

Helice constrictella Zeller, on *Ulmus*

Blastobasidae

Holcocera aphidiella Walsingham, larva in a *Phylloxera* gall on *Carya*

Osmopterygidae (= Lavernidae)

Cosmopteryx pulchrimella Chambers, on *Pilea*

Yponomeutidae

Argyresthia undulatella Chambers, on *Ulmus*

Tortricidae

Anchylopera fuscociliana Clemens, on *Ulmus*
Archips argyrosipilis Walker, Fruit-tree Leaf Roller, on *Carya*, *Juglans nigra*, *Ulmus*
Archips infumatana Zeller, on *Carya*
Archips negundanus (Dyar), Leaf Roller, on *Ulmus*
Archips semifervans Walker, on *Hamamelis virginiana*
Cymolomia electropusca Heinrich, on *Comptonia peregrina*
Eulia juglandana Fernald, on *Carya*, *Juglans*

- Exentera improbana* Walker, on *Carya*
Laspeyresia caryana Fitch, Pecan Shuck-worm, on *Carya*
Laspeyresia pomonella (L.), Coddling Moth, on *Juglans*
Sparganothis karacana Kearfott, on *Myrica*
Strepsicrates indentatus Dyar, on *Myrica*
- Cossidae
Prionoxystus robiniae (Peck), Carpenter Worm, on *Ulmus americana*
Zeuzera pyrina L., Leopard Moth, on *Juglans*, *Ulmus*
- Pyalidae
Acrobasis angusella Grote, on *Carya*
Acrobasis caryae Grote, on *Carya*
Acrobasis caryivorella Ragonot, on *Carya*
Acrobasis comptoniella Hulst, on *Comptonia peregrina*, *Myrica*
Acrobasis demotella Grote, on *Juglans*
Acrobasis kearfottella Dyar, on *Carya*
Acrobasis stigmatella Dyar, on *Carya*
Canarsia ulmiarrosorella Clemens, on *Carya*, *Ulmus*
Euzophera semifumeralis (Walker), American Plum Borer, on *Carya*, *Juglans*, *Liquidambar*, *Morus*, and *Platanus*
Pyrausta fumiferalis Hulst, on *Carya*
Salebria celtidella Hulst, on *Celtis occidentalis*
Tetralopha asperatella Clemens, on *Ulmus*
- Papilionidae
Papilio glaucus L., Tiger Swallowtail, on *Humulus lupulus*, *Carya*
- Lycaenidae
Strymon calanus (Hubner), on *Carya* sp.
- Libytheidae
Libythea bachmanii Kirtland, Snout Butterfly, on *Celtis occidentalis*
- Nymphalidae
Nymphalis antiopa (L.), Mourning Cloak, on *Celtis occidentalis*, *Humulus lupulus*, *Ulmus americana*
Nymphalis j-album (Boisduval & Leconte), Large Tortiseshell, on *Humulus lupulus*
Nymphalis milberti (Godart), Small Tortiseshell, on *Urtica dioica*
Polygonia comma (Harris), Hop Merchant, on *Boehmeria cylindrica*, *Celtis occidentalis*, *Humulus lupulus*
Polygonia interrogationis (Fabr.), The Semicolon, on *Boehmeria cylindrica*, *Celtis occidentalis*, *Humulus lupulus*, *Ulmus* sp.
Polygonia progne (Cramer), Gray Comma, on *Humulus lupulus*
Vanessa atalanta (L.), Red Admiral, on *Boehmeria cylindrica*, *Ulmus* sp., *Urtica* sp.
- Sphingidae
Ceratomia amyntor (Hubner), Four Horned Sphinx, on *Ulmus americana*
Cressonia juglandis (Abbot & Smith), on *Carya tomentosa*, *Juglans* spp.
Dolba hylaeus (Drury), on *Comptonia peregrina*
Sphinx drupiferarum Abbot & Smith, on *Celtis occidentalis*
Sphinx gordius Cramer, on *Comptonia peregrina*, *Myrica pensylvanica*
Sphinx luscitiosa Clemens, on *Myrica pensylvanica*
- Saturniidae
Actias luna (L.), Luna Moth, on *Carya* sp., *Humulus lupulus*, *Juglans cinerea*, *Juglans nigra*, on *Liquidambar styraciflua*
Antheraea polyphemus (Cramer), Polyphemus Moth, on *Liquidambar styraciflua*
Automeris io Fabr., Io Moth, on *Carya* sp., *Comptonia peregrina*, *Humulus lupulus*, *Myrica pensylvanica*, *Ulmus*
Callosamia promethea (Drury), on *Liquidambar styraciflua*
Hyalophora cecropia L., Cecropia Moth, on *Ulmus*
- Citheroniidae
Anisota senatoria (J.E.Smith), Orange Striped Oak Worm, on *Carya*
Anisota stigma (Fabr.), on *Carya* sp.
Citheronia regalis (Fabr.), on *Carya* sp.
Eacles imperialis (Drury), Imperial Moth, on *Carya* sp., *Ulmus americana*, *Ulmus rubra*, *Ulmus thomasi*

Arctiidae

- Arctia caja* (L.), Tiger Moth, on *Urtica dioica*
Halisidota caryae (Harris), Hickory Tussock Moth, on *Carya glabra*, *Carya tomentosa*, *Celtis occidentalis*, *Humulus lupulus*, *Juglans cinerea*, *Juglans nigra*, *Ulmus americana*
Halisidota harrisii (Walsh), on *Platanus occidentalis* and *Platanus* × *hybrida*
Halisidota maculata (Harris), Spotted Tussock Moth, on *Carya ovata*
Halisidota tessellaris (Abbot & Smith), Banded Tussock Moth, on *Carya ovalis*, *Carya tomentosa*, *Ulmus americana*, *Ulmus rubra*
Hyphantria cunea (Drury), Fall Webworm, on *Carya* sp., *Humulus lupulus*, *Juglans nigra*, *Liquidambar styraciflua*, *Ulmus americana*
Pyrrharctia isabella (J.E. Smith), on *Ulmus americana*
Utetheisa bella (L.), Rattlebox Moth, on *Myrica gale*

Noctuidae

- Acrionicta americana* Harris, American Dagger Moth, on *Carya cordiformis*, *Carya tomentosa*, *Ulmus americana*
Acrionicta rubricoma Guenee, on *Celtis occidentalis*
Baileya dormitans (Guenee), on *Carya* sp.
Balsa malana (Fitch), May Spotted Apple-worm, on *Ulmus americana*
Catocala antinympha (Hubner), on *Comptonia peregrina*
Catocala badia Grote & Robinson, on *Comptonia peregrina*, *Myrica pensylvanica*
Catocala coelebs Grote, on *Myrica gale*
Catocala flebilis Grote, on *Carya ovata*
Catocala obscura Strecker, on *Carya ovata*
Catocala resecta Grote, on *Carya ovata*
Celama triquetra Fitch, on *Hamamelis virginiana*
Cemamica picta (Harris), Zebra Caterpillar, on *Humulus lupulus*
Diachrysia balluca Geyer, on *Humulus lupulus*
Heliothis zea (Boddie), Corn-ear Worm, on *Cannabis sativa*
Hypena humuli (Harris), Hops Snout-moth, on *Humulus lupulus*
Laphygma frugiperda (Abbot & Smith), Fall Army-worm, on *Carya*
Lithophane antennata (Walker), Green Fruit-worm, on *Carya*, *Ulmus*
Morrisonia confusa (Hubner), on *Carya* sp.
Orthosia hibisci (Guenee), on *Carya* sp.
Papaipema cataphracta (Grote), Burdock Borer, on *Cannabis sativa*
Paipapema nebris (Guenee), Common Stalk Borer, on *Cannabis sativa*
Peridroma margaritosa (Haworth), Variegated Cutworm, on *Humulus lupulus*
Polia detracta (Walker), on *Carya* sp.
Polia purpurissata (Grote), on *Comptonia peregrina*
Prodenia dolichos (Fabr.), on *Carya* sp.
Scolecocampa liburna (Geyer), on *Carya* sp.

Notodontidae

- Dasylophia thyatiroides* (Walker), on *Carya* sp.
Datana angusi Grote & Robinson, on *Carya* sp., *Juglans* sp.
Datana contracta Walker, on *Carya* sp., *Hamamelis virginiana*
Datana integerrima Grote & Robinson, Walnut Datana, on *Carya* sp., *Juglans cinerea*, *Juglans nigra*
Datana ministra (Drury), Yellow Necked Apple-worm, on *Carya cordiformis*, *Carya glabra*, *Carya laciniata*, *Carya tomentosa*, *Hamamelis virginiana*, *Juglans cinerea*, *Ulmus*
Heterocampa guttivitta (Walker), Maple Prominent, on *Carya* sp.
Heterocampa leucostigma (Smith), on *Platanus occidentalis*, *Ulmus*
Schizura concinna (J.E. Smith), Redhumped Caterpillar, on *Carya*, *Juglans*, *Liquidambar*, *Ulmus*
Schizura ipomaeae Doubleday, Unicorn Caterpillar, on *Ulmus*
Schizura leptinoides (Grote), Red-humped Apple-worm, on *Carya glabra*, *Carya ovalis*, *Carya tomentosa*, *Carya* sp., *Myrica pensylvanica*
Schizura unicornis (Abbot & Smith), Unicorn Prominent, on *Carya* sp.

Lymantriidae (= Liparidae)

Dasychira basiflava (Packard), on *Carya* sp.

Dasychira dorsipennata (B. & McD.) (= *Olene achatina* (Abbot & Smith), on *Carya* sp.

Dasychira meridionalis (B. & McD.) (= *Olene atomaria* (Walker), on *Carya* sp.

Euproctis chrysorrhoea (L.) (= *Nygmia phaeorrhoea* Donovan, Brown tail Moth, on *Carya* sp., *Myrica pensylvanica*

Lymantria dispar (L.), Gypsy Moth, on *Carya*, *Ulmus*

Orgyia antiqua (L.), Antique Tussock-moth, on *Humulus lupulus*

Lasiocampidae

Malacosoma americana Fabr., Eastern Tent Caterpillar, on *Hamamelis virginiana*, *Liquidambar styraciflua*

Malacosoma disstria Hubner, Forest Tent Caterpillar, on *Carya* sp., *Liquidambar styraciflua*

Drepanidae

Drepania bilineata (Packard), on *Ulmus americana*

Geometridae

Abbottana clemataria (Abbot & Smith), on *Carya* sp.

Alsophila pometaria (Harris), Fall Canker Worm, on *Carya* sp., *Celtis occidentalis*, *Ulmus americana*

Amphidasis cognataria Guenee, Pepper and Salt Currant Moth, on *Comptonia peregrina*

Cingilia catenari (Drury), Chain-dotted Geometer, on *Comptonia peregrina*, *Myrica gale*, *Myrica pensylvanica*

Cleora sublunaria (Guenee), on *Comptonia peregrina*

Cosymbia myrtaris (Guenee), on *Comptonia peregrina*

Cosymbia pendulinaria (Guenee), on *Comptonia peregrina*

Ellopiia fiscellaria Guenee, on *Ulmus americana*

Ennomos subsignarius (Hubner), Elm Spanworm on *Carya* sp., *Ulmus*

Erannis tiliaria (Harris), Lime Tree Winter Moth, on *Carya* sp., *Humulus lupulus*, *Ulmus americana*

Euchlaena effecta (Walker), on *Comptonia peregrina*

Eulype hastata (L.), on *Comptonia peregrina*, *Myrica gale*

Melanolophia canadaria (Guenee), on *Myrica gale*, *Ulmus thomasii*

Nematocampa limbata (Haworth), on *Carya* sp., *Humulus lupulus*

Nemoria mimosaria (Guenee), on *Myrica pensylvanica*

Nemoria rubrifrontaria (Packard), on *Comptonia peregrina*

Paleacrita vernata (Peck), Spring Canker Worm, on *Carya glabra*, *Carya ovata*, *Carya* sp., *Celtis occidentalis*,
Ulmus americana

Paraphia unipunctata (Haworth), on *Carya* sp.

Phigalia titea (Cramer), Half-winged Geometer, on *Ulmus americana*

Racheospila rubrolinearia (Packard), on *Myrica* sp.

Tetraxis lorata Grote, on *Comptonia peregrina*

DIPTERA

Cecidomyiidae

Aphidoletes hamamelidis Felt, on *Hamamelis virginiana*

Arthrocnodax rufa Felt, on *Carya*

Camptoneuromyia hamamelidis Felt, on *Hamamelis virginiana*

Camptoneuromyia virginica Felt, on *Hamamelis virginiana*

Caryomyia antennata Felt, leaf gall on *Carya*

Caryomyia carya O.S., leaf gall on *Carya*

Caryomyia caryaecola O.S., leaf gall on *Carya cordiformis*, *Carya* sp.

Caryomyia consobrina Felt, leaf gall on *Carya*

Caryomyia glutinosa O.S., on leaves of *Carya*

Caryomyia inamis Felt, leaf gall on *Carya*

Caryomyia nucicola O.S., gall in *Carya ovata* husks

Caryomyia persicoides Bt., leaf gall on *Carya*

Caryomyia similis Felt, leaf gall on *Carya*

Caryomyia thompsoni Felt, leaf gall on *Carya*

Caryomyia tubicola O.S., leaf gall on *Carya*

Dasyneura multiannulata Felt, on *Carya*
Dentifibula caryae Felt, on *Carya*
Feltiella acerifolia Felt, on *Ulmus americana*
Itonida abdominalis Felt, on *Carya*
Itonida albotarsa Felt, on *Carya*
Lasioptera humulicaulis Felt, on *Humulus lupulus*
Lestodiplosis hicoriae Felt, on *Carya*
Mycodiplosis angulata Felt, on *Carya*
Neolasioptera hamamelidis Felt, on *Hamamelis virginiana*
Oligarces ulmi Felt, on *Ulmus americana*
Parallelodiplosis caryae Felt, on *Carya*
Phytophaga ulmi Felt, on *Ulmus americana*
Schizomyia caryaecola Felt, on *Carya cordiformis*
Trotteria caryae Felt, on *Carya*
Trotteria metalica Felt, on *Carya*
 Agromyzidae
Agromyza flaviceps Fall., on *Humulus lupulus*
Agromyza frontalis Meig., on *Humulus lupulus*
Agromyza posticata Meig., on *Liquidambar styraciflua*
Agromyza reptans Fall, on *Laportea canadensis*, *Urtica dioica*, *Urtica urens*
Agromyza scutellata Fall., on *Liquidambar styraciflua*
Agromyza ulmi Frost, on *Ulmus americana*
Domomyza mobilis Meig., on *Urtica dioica*, *Urtica urens*

HYMENOPTERA

Pergidae
Acordulecera musta MacG., on *Carya*
 Tenthredinidae
Eriocampa juglandis (Fitch), Bitternut Woolly Worm, on *Carya*, *Juglans cinerea*, *Juglans nigra*
Eriocampa rotunda (Nort.), on *Juglans cinerea*
Fenusa ulmi Sundewall, Elm leaf-miner, on native species of *Ulmus*, as well as *Ulmus glabra*, *Ulmus procera*
Macrophya externa (Say), on *Carya*
Periclista caryicola (Dyar), on *Carya*
Pteronidea erythrogaster (Nort.), on *Morus alba*
 Sphecidae
Crabro americanus (Leach), Elm Sawfly, on *Ulmus*
 Xiphydriidae
Xiphydria hicoriae Roh., larva in *Carya*
 Siricidae
Tremex columba L., Horntail, larva in *Carya*, *Platanus*, *Ulmus*

BIBLIOGRAPHY

- Abbe, E. C. 1963. The male flowers and inflorescences of the Myricaceae. (Abstr.) Am. Jour. Bot. 50: 632.
- Adams, R. 1940. Marihuana. Science 92: 115-119.
- Agardh, J. 1858. Theoria Systematis Plantarum, etc., Lund, 404 pp.
- Anderson, E. 1933. Variation in flower color in *Hamamelis vernalis*. Jour. Arnold Arbor. 14: 253-257.
- _____ & K. Sax. 1935. Chromosome numbers in the Hamamelidaceae and their phylogenetic significance. Jour. Arnold Arbor. 16: 210-215.
- Anderson L. 1934. A study of systematic wood anatomy in *Cannabis*. Bot. Mus. Leaflet. 24: 29-36.
- Andrews, G. & S. Vinkenoog (eds.). 1967. The Book of Grass, and Anthology on Indian Hemp. New York, 242 pp.
- Arnoux, M. 1963. Influence des facteurs du milieu sur l'expression de la sexualité du chanvre monoïque. (*Cannabis sativa* L.). I. Action du cycle photopériodique. Ann. Amel. Pl. 13: 27-49.
- Ash, A. L. 1948. Hemp-production and utilization. Econ. Bot. 2: 158 -- 169.
- Auganbaugh, J. 1967. All about hickory. Am. Forests 73: 29, 30, 42, 44, 46.
- Babcock, E. B. 1911. Walnut-oak hybrid experiments. Am. Breed. Assoc. Rep. 6: 138-140.
- _____ 1915. Walnut mutant investigations. Proc. Natl. Acad. Sci. (U. S.) 1: 535-537.
- Baillon, H. 1871. Nouvelle notes sur les Hamamelidees. Adansonia 10: 120-137.
- _____ 1872. Urticees. Hist. Pl. 3: 496-537.
- _____ 1880. Ulmacees. Hist. Pl. 6: 137-216.
- Baird, M. 1915. The anatomy of *Platanus occidentalis*. Univ. of Kansas Sci. Bull. 9: 281-290.
- Barton, L. V. 1932. The germination of bayberry seeds. Contr. Boyce Thompson Inst. 4: 19-25.
- Bassett, I. J. & C. W. Crompton. 1976. The annual species of stinging nettle (*Hesperocnide* and *Urtica*) in North America. Canad. Jour. Bot. 54: 374-383.
- _____ & D. W. Woodland. 1974. The family Urticaceae in Canada. Canad. Jour. Bot. 52: 503-516.
- _____ 1977. The biology of Canadian weeds. 21. *Urtica dioica* L. Canad. Jour. Pl. Sci. 57: 491-498.
- Bayer, G. 1957. Die grosse Brennessel (*Urtica dioica* L.) in ihre Bedeutung für die Gesundheit von Mensch, Tier und Pflanze. Planta Med. 5: 12-23.
- Beard, F. H. 1943. Hops: their varieties and cultivation. Jour. Inst. Brewing 39: 118-125.
- Beattie, R. K. 1933. How the Dutch elm disease reached America. Proc. Nat. Shade Tree Confer. 9: 101-105.
- Bechtel, A. R. 1921. The floral anatomy of the Urticales. Am. Jour. Bot. 8: 386-410.
- Bell, P. R. 1958. Twining of the hop (*Humulus lupulus* L.). Nature 181: 1009-1010.
- Bentham, G. & J. D. Hooker. 1880a. Urticaceae. In: Gen. Pl. 3: 341 -395. [including Ulmae: 351-356.]
- _____ 1880b. Juglandaceae. *Ibid.* 3: 397-400.
- _____ 1880c. Myricaceae. *Ibid.* 3: 400-401.
- Berg, C. 1977. Urticales, their differentiation and systematic position. Pl. Syst. Evol. Suppl. 1: 349-374.
- Bernard, C. 1905. Sur la distribution géographique des Ulmacees. Bull. Herb. Boiss. II. 5: 1097-1112.
- Bernbeck, F. 1932. Vergleichende Morphologie der Urticeen- und Moraceen Infloreszenzen. Bot. Abh. Jena, vol. 19, 100 pp.
- Berry, E. W. 1906. Living and fossil species of *Comptonia*. Am. Midl. Nat. 40: 485-524.
- _____ 1912. Notes on the geological history of the walnuts and hickories. Pl. World 15: 225-240.
- _____ 1914. Notes on the geological history of *Platanus*. Pl. World 17: 1-8.
- _____ 1920. The geological history of the sweet gum and witch hazel. Pl. World 22: 345-354.
- Bessey, E. A. 1933. Sex problems in hemp. Quart. Rev. Biol. 8: 194- 200.
- Bigalke, H. 1933. Die Blattspodogramme der Urticeen und ihre Verwendbarkeit für die Systematik. Beitr. Biol. Pflanzen 21: 1-58.
- Billings, F. H. 1905. Precursory leaf-serrations of *Ulmus americana*. Bot. Gaz. 40: 224-225.
- Bishop, L. R. 1949. The resins of hops as antibiotics. Soc. Exper. Biol. Symp. 3: 101-104.
- Blatt, A. H. 1938. A critical survey of the literature dealing with the chemical constituents of *Cannabis sativa*. Jour. Wash. Acad. Sci. 28: 465-477.
- Bogle, A. 1970. Floral morphology and vascular anatomy of the Hamamelidaceae: the apetalous genera of Hamamelidoidae. Jour. Arnold Arbor. 51: 310-366.
- Boivin, B. 1867. Les *Celtis* du Canada. Natur. Canad. 94: 621-624.
- Bond, G. 1951. The fixation of nitrogen associated with the root nodules of *Myrica gale* L., with special reference to its pH relation and ecological significance. Ann. Bot. II. 15: 447-459.

- Boothroyd, L. 1930. The morphology and anatomy of the inflorescence and flower of *Platanaceae*. *Am. Jour. Bot.* 17: 678–693.
- Borthwick, H. A., & N. J. Scully. 1954. Photoperiodic responses of hemp. *Bot. Gaz.* 116: 14–29.
- Bottomley, W. 1912. The root nodules of *Myrica gale*. *Ann. Bot.* 26: 111–117.
- Boucher, F., J. Unger & M. Paris. 1974. *Le Cannabis sativa* L.: “races chimiques ou varietas”. *Plant. Med. et Phytotherapie* 8: 20–31.
- Brett, D. 1979. Ontogeny and classification of the stomatal complex of *Platanus*. *Ann. Bot.* 44:P 249–251.
- Bretzler, E. 1899. Studien uber die Gattung *Platanus* L. *Verh. Leop-Carol. Akad. Naturforsch.* 77: 115–226.
- _____. 1924. Beitrage zur Kenntnis der Gattung *Platanus*. *Bot. Arch.* 7: 388–417.
- Britton, E. 1887. Elongation of the inflorescence in *Liquidambar*. *Bull. Torrey Bot. Club* 14: 95–96.
- Brooks, M. G. 1949. Effect of black walnut trees and their products on other vegetation. *W. Virginia Agric. Exp. Sta. Bull.* 347, 41 pp.
- Brooks, S. N., C. E. Horner & S. T. Likens. 1961a. Hop production. *U. S. D. A. Agric. Inform. Bull.* 240, 46 pp.
- _____. & S. T. Likens. 1961b. Variability of morphological and chemical quality characters in flowers of male hops. *Crop Sci. Madison* 2: 189–192.
- Brouwer, J. 1908. Studies in *Platanaceae*. *Rec. Trav. Bot. Neerl.* 21: 369–382.
- Brown, R. L. 1942. Supposed extinct maples. [= *Platanus*] *Science* 96: 15.
- _____. 1953. A Cretaceous sweet gum. *Bot. Gaz.* 94: 611–615.
- Brush, W. D. 1917. Distinguishing characters of North American sycamore woods. *Bot. Gaz.* 64: 480–496.
- _____. 1920. Utilization of Sycamore. *U. S. Dept. Agric. Bull.* 884, 24 pp.
- Burgess, A. H. 1964. Hops—botany, cultivation and utilization. In: N. Polunin (ed.), *World Crop Books*, London Press, 600 pp.
- Burt, B. 1939. Leaf-color forms in *Myrica gale*. *Jour. Bot.* 77: 91–93.
- Candolle, C. de. 1862. Memoire sur la famille des Juglandacees. *Ann. Sci. Nat. Bot.* IV. 18: 5–48.
- Camp, W. H. 1932. The floral anatomy of hemp (*Cannabis sativa* L.). *Ohio State Univ. Abst. Doct. Diss.* 9: 50–59.
- _____. 1936. The antiquity of hemp as an economic plant. *Jour. N. Y. Bot. Gard.* 37: 110–114.
- Charen, S. 1945. Facts about marijuana, a survey of the literature. *Am. Jour. Pharm.* 117: 422–430.
- Cheuvart, C. 1954. Experiences sur le developpement de *Cannabis sativa* L. *Acad. Belg. Bull. Sci.* V. 40: 1152–1168.
- Chevalier, A. 1901. Monographie des Myricacees; anatomie et histologie, organographie, classification et description des especes, distribution géographique. *Mem. Soc. Natl. Sci. Natur. Math., Cherbourg* 32: 85–340.
- Chew, W. L. 1965. *Laportea* and allied genera (Urticaceae). *Gard. Bull. Singapore* 21: 195–208.
- Chittenden, A. & W. Hatt. 1905. The red gum; with a discussion of mechanical properties of the red gum wood. *U. S. Dept. Agric. Bur. Forestry Bull.* 58, 56 pp.
- Christenson, A. 1850. On *Cannabis indica*, Indian Hemp. *Trans. Bot. Soc. Edinburgh* 4: 59–69.
- Coffman, C. & W. Gentner. 1975. Cannabinoid profile and elemental uptake of *Cannabis sativa* L., as influenced by soil characteristics. *Agron. Jour.* 67: 491–497.
- Collier, H. O. J., & G. B. Chesher. 1956. Identification of 5-hydroxytryptamine in the sting of the nettle (*Urtica dioica*). *Brit. Jour. Pharm. Chemother.* 11: 186–189.
- Commission on Narcotic Drugs. 1965. The question of cannabis: cannabis bibliography. *U. N. Econ. & Soc. Council, E/CN.4/79*, 250 pp.
- Cook, O. F. 1923. Evolution of compound leaves in walnuts and hickories. *Jour. Hered.* 14: 77–88.
- Corner, E. J. H. 1962. The classification of *Moraceae*. *Gard. Bull. Singapore* 19: 187–252.
- Dallimore, W. 1920. Elms and elm timber. *Quart. Jour. Forestry* 14: 109–118.
- Dapper, H. 1967. Monozie und Hormaphroditismus bei *Urtica dioica* L. *Flora B. Morph. Geobot.* 157: 97–99.
- Dark, S. O. S. 1950. The cytology of the hop. A critical review of published work. *Wye Coll. Dept. Hop Res. Ann. Rep.* 1949: 48–54.
- Davis, E. L. 1957. Morphological complexes in hops (*Humulus lupulus* L.) with special reference to the American race. *Ann. Missouri Bot. Gard.* 44: 271–294.
- _____. & R. Burns. 1962. The use of vapor fractometry in the analysis of some New England hops. *Rhodora* 64: 243–251.
- Detwiler, S. B. 1916. The American elm (*Ulmus americana*). *Am. Forestry* 22: 259–267.
- Dewey, L. H. 1902. The hemp industry in the United States. *Yearbook U. S. Dept. Agric.* 1901: 541–554.
- Duncan, W. H. 1959. Leaf variation in *Liquidambar styraciflua* L. *Castanea* 24: 99–111.
- Duquenois, P. 1950. chemical and physiological identification of Indian hemp. *Bull. Narc.* 2: 30–33.
- Edwardson, J. R. 1952. Hops—their botany, history, production and utilization. *Econ. Bot.* 6: 160–175.

- Ehara, K. 1956. Comparative morphological studies on the hop (*Humulus lupulus* L.) and the Japanese hop (*H. japonicus* Sieb. & Zucc.). Jour. Fac. Agric. Kyushu Univ. 10: 209–232.
- Elias, T. 1970. The genera of Ulmaceae in the southeastern United States. Jour. Arnold Arbor. 51: 18–40.
- Emboden, W. 1972. Ritual use of *Cannabis sativa* L.: a historical ethnographic survey. In: Furst, P. (ed.) *Flesh of the Gods*, Praeger, New York, pp. 244–286.
- _____ 1974. *Cannabis*, a polytypic genus. Econ. Bot. 28: 304–310.
- Emmelin, N. & W. Feldberg. 1947. The mechanism of the sting of the common nettle (*Urtica urens*). Jour. Physiol. 106: 440–455.
- Endo, S. 1933. The American white walnut or butternut, *Juglans cinerea* L., from the Upper Pliocene of Japan. Jour. Wash. Acad. Sci. 23: 305–308.
- Endress, P. 1967. Systematische Studie über die verwandtschaftlichen Beziehungen zwischen den Hamamelidaceen und Betulaceen. Bot. Jahrb. Syst. 87: 431–525.
- _____ 1970. die Infloreszenzen der apetalen Hamamelidaceen, ihre grundsätzliche morphologische und systematische Bedeutung. Bot. Jahrb. Syst. 90: 1–54.
- Engler, A. 1888a. Ulmaceae. In: Nat. Pflanz. III, 1: 59–66.
- _____ 1888b. Urticaceae. *Ibid.* III, 1: 98–118.
- _____ 1894. Juglandaceae. *Ibid.* III, 1: 19–25.
- _____ 1894. Myricaceae. *Ibid.* III, 1: 26–28.
- Ernst, W. 1963. The genera of Hamamelidaceae and Platanaceae in the southeastern United States. Jour. Arnold Arbor. 44: 193–210.
- Fang, T. K. 1957. Observations of the morphology and anatomy in the rhizome of hop (*Humulus lupulus* L.). [In Chinese with an English summary] Acta Bot. Sin. 6: 297–310.
- Farnsworth, N. R. 1968. Hallucinogenic plants. Science 162: 1086–1092.
- _____ 1969. Pharmacognosy and chemistry of *Cannabis sativa*. Jour. Am. Pharm. Assoc. II. 9: 410–414, 440.
- Fernald, M. L. 1910. Notes on *Boehmeria cylindrica* var. *drummondiana*. Rhodora 12: 10–11.
- _____ 1914. The glabrous-leaved sweet gale. Rhodora 16: 167.
- _____ 1926. *Urtica gracilis* and some related North American species. In: Two summers of botanizing in Newfoundland. Rhodora 28: 191–199.
- _____ 1936a. *Pilea* in eastern North America. I. Contr. Gray Herb. 113.
- _____ 1936b. *Ibid.* II. Rhodora 38: 169–170.
- _____ 1938. Noteworthy plants of southeastern Virginia. Rhodora 40: 364–424; 434–459; 467–485.
- _____ 1945. Botanical specialties of the Seward Forest and adjacent areas of southeastern Virginia. Rhodora 47: 93–142.
- _____ 1950. Gray's Manual of Botany. 8th ed. Am. Book Co., New York, 1632 pp.
- Fetterman, P. 1971. Mississippi-grown *Cannabis sativa* L.: preliminary observations on chemical definition of phenotype and variations in tetrahydrocannabinol content versus age, sex and plant part. Jour. Pharm. Sci. 60: 1246–1249.
- Fletcher, W. 1955. The development and structure of the root-nodules of *Myrica gale* L. with special reference to the nature of the endophyte. Ann. Bot. II. 19: 501–513.
- Foerste, A. 1892. On the relations of certain fall to spring blossoming plants. Bot. Gaz. 17: 1–8.
- Fox, W.S., & J. H. Soper. 1954. The distribution of some trees and shrubs of the Carolinian Zone of southern Ontario. Part III. Trans. Roy. Canad. Inst. 30, II: 99–130.
- Freisleben, R. 1933. Untersuchungen über Bildung und Auflösung von Cystolithen bei den Urticales. Flora 127: 1–45.
- Fullung, E. 1953. American witch hazel—history, nomenclature and modern utilization. Econ. Bot. 7: 359–381.
- Gamage, J. R., & E. L. Zarkin. 1969. A comprehensive guide to the English language literature on *Cannabis* (Marihuana). STASH Bibliographic Series 1, STASH Press, Beloit, Wisc., 265 pp.
- Geltman, D. 1982. New sections and subsections of the genus *Urtica*, Urticaceae. Soc. Bot. Ah. (Leningrad) 67: 1413–1416.
- Giannasi, D. 1978. Generic relationships in the Ulmaceae, based on flavonoid chemistry. Taxon 27: 331–334.
- Gleason, H. 1908. Platanaceae. In: North Am. Flora 22: 227–229.
- _____ 1922. The witch hazels. Jour. N. Y. Bot. Gard. 23: 17–19.
- Godwin, H. 1967a. The ancient cultivation of hemp. Antiquity 41: 42–49; 137–138.
- _____ 1967b. Pollen-analytical evidence for the cultivation of *Cannabis* in England. Rev. Palaeobot. Palynol. 4: 71–80.
- Goldblatt, P., and P. Endress. 1977. Cytology and evolution in Hamamelidaceae. Jour. Arnold Arbor. 58: 67–71.
- Gregory, E. 1888. The development of corky wings on certain trees. II. Bot. Gaz. 13: 281–287.
- Griggs, R. 1909. On the characters and relationships of Platanaceae. Bull. Torrey Bot. Club 36: 369–395.

- Grinspoon, L. 1969. Marihuana. *Sci. Am.* 221: 17–25.
- Guerin, P. 1923. Les Urticees: cellules a mucilage, laticiferes et canaux secreteurs. *Bull. Soc. Bot. France* 70: 125–263.
- Haarer, A. E. 1953. *Cannabis sativa*. In: *World Crops* 5: 445–448.
- Hakansson, A. 1955. Endosperm formation in *Myrica gale* L. *Bot. Not.* 108: 616.
- Hall, H. M. 1918. Walnut pollen as a cause of hay fever. *Science* 47: 516–517.
- Hallier, H. 1903. Über den Umfang, die Gliederung und die Verwandtschaft der Familie der Hamamelidaceen. *Beih. Bot. Centr.* 14: 247–260.
- Haney, A., & B. Kutsheid. 1975. An ecological study of naturalized hemp (*Cannabis sativa* L.) in east-central Illinois. *Am. Midl. Nat.* 93: 1–24.
- Hans, A. S. 1970. Chromosome numbers in the Juglandaceae. *Jour. Arnold Arbor.* 51: 534–539.
- Hara, H. 1952. Contributions to the study of variations in the Japanese plants closely related to those of Europe or North America. Part 1. *Jour. Fac. Sci. Univ. Tokyo Bot.* 6: 29–96.
- Harlow, W. M. 1930. The formation of chambered pith in the twigs of butternut and black walnut. *Jour. Forestry* 28: 739–741.
- _____ & E. S. Harrar. 1958. *Textbook of Dendrology*. McGraw-Hill Book Co., 512 pp.
- Harms, H. 1930. Hamamelidaceae. *Nat. Pflanz.* II. 18a: 303–305.
- Hayward, H. E. 1938. *The Structure of Economic Plants*, New York, 674 pp.
- Heimsch, C. H., & R. H. Wetmore. 1939. The significance of wood anatomy in the taxonomy of the Juglandaceae. (Abstr.) *Am. Jour. Bot.* 26: 651–660.
- Henrotin, M. 1939. Anatomie de la tige et des bourgeons axillaires series dan le genre *Juglans*. *Lejeunia Mem.* 1: 1–57.
- Henry, A., & M. Flood. 1919. The history of the London plane, *Platanus acerifolia*, with notes on the genus *Platanus*. *Proc. Irish Acad. Bot.* 35: 9–28.
- Hermann, F. J. 1940. the geographic distribution of *Pilea fontana*. *Torrey* 40: 114–120.
- _____ 1946. The perennial species of *Urtica* in the United States, east of the Rocky Mountains. *Am. Midl. Nat.* 35: 773–778.
- Heslop-Harrison, J. 1957. the experimental modification of sex expression in flowering plants. *Biol. Rev.* 32: 38–90.
- Heywood, V. H., & P. Ball. 1964. Urticaceae. In: T. Tutin, *et al.*, *Flora Europaea* 1: 67–69.
- Higgins, D. J. & T. Arisumi. 1959. Time of floral differentiation in *Ulmus americana*, *U. pumila* and *U. carpinifolia*. *Bot. Gaz.* 120: 177–180.
- Hill, E. 1900. *Celtis pumila* Pursh, with notes on allied species. *Bull. Torrey Bot. Club* 27: 496–505.
- Hinton, B. D. 1968. The native annual *Parietaria* (Urticaceae) of the conterminous United States and Canada. Masters Thesis, Univ. of Southwestern Louisiana.
- Hjelmqvist, H. 1948. Studies on the floral morphology and phylogeny of the Amentiferae. *Bot. Not. Suppl.* 2: 1–171.
- Holm, T. 1921. Morphological study of *Carya alba* and *Juglans nigra*. *Bot. Gaz.* 72: 375–389.
- _____ 1927. *Boehmeria cylindrica* (L.) Sw. — a morphological study. *Am. Jour. Sci.* 13: 115–122.
- Horne, A. 1914. A contribution to the study of the evolution of the flower, with special reference to the Hamamelidaceae, Caprifoliaceae and Cornaceae. *Trans. Linn. Soc. II. Bot.* 8: 239–309.
- Houlbert, C. 1899. Phylogenie des Ulmacees. *Rev. Genet. Bot.* 11: 106–119.
- Hultén, E. 1958. The amphi-Atlantic plants and their phytogeographical connections. *Svensk. Vet.-Akad. Hand. IV.* 7: 1–340.
- Illick, J. S. 1921. The American walnuts. *Am. Forestry* 27: 699–704.
- Jacobson, P. 1957. The sex chromosomes in *Humulus*. *Hereditas* 43: 357–370.
- Jaenicke, F. 1899. Studien über die Gattung *Platanus* L. 1892 — 1897. *Nova Acta Acad. Leop-Carol.* 77: 113–126.
- Janko, J. 1890. Abstammung der Platanen. *Bot. Jahrb.* 11: 412–458.
- Jarmolenko, A. V. 1941. An attempt at the construction of a system of the genus *Parietaria* and related forms. *Acta Inst. Bot. Acad. Sci. URSS.* 1. Syst. 5: 319–330. [In Russian with English summary]
- Jay, M. 1968. Distribution des flavonoides chez les Hamamelidacees et familles affines. *Taxon* 17: 136–147.
- Jha, U. 1978. Chemotaxonomy of the Hamamelidaceae. *Jour. Indian Bot. Soc.* 56: 44–48.
- Johnson, L. P. V. 1946. Fertilization in *Ulmus* with special reference to hybridization procedure. *Canad. Jour. Res.* 24: 1–3.
- Joyce, C. & S. Curry (eds.). 1970. *The Botany and Chemistry of Cannabis*. Ciba Foundation, Churchill, London, 217 pp.
- Karsten, G. 1902. Über die Entwicklung der weiblichen Blüten bei einigen Juglandaceen. *Flora* 90: 316–333.
- Kershaw, E. 1909. The structure and development of the ovule of *Myrica gale*. *Ann. Bot.* 23: 353–362.
- Kimura, M. & J. Okamoto. 1970. distribution of tetrahydrocannabinolic acid in fresh, wild *Cannabis*. *Experimentia* 26: 819–820.

- Kohler, D. 1958. Die Entwicklung von *Cannabis sativa* unter dem Einfluss verschiedener Tageslangen. *Physiol. Plant.* 11: 249–259.
- _____ 1962. Homozygous males in hemp. *Nature* 195: 625–626.
- Koidzumi, G. 1937. On the classification of Juglandaceae. *Acta Phytotax. Geobot.* 6: 1–17.
- Krause, O. 1930. Cytologische Studien bei den Urticales. *Ber. Deutch. Bot. Ges.* 48: 9–13.
- Krembs, A. 1901. The structure of stems of *Myrica gale* L. and *Myrica cerifera* L. *Pharm. Arch.* 4: 128–136.
- Kribs, D. A. 1927. Comparative anatomy of the woods of the Juglandaceae. *Trop. Woods* 12: 16–21.
- Langdon, L. M. 1931. Development and vascular organization of foliar organs of *Carya cordiformis*. *Bot. Gaz.* 91: 277–294.
- _____ 1934. Embryogeny of *Carya* and *Juglans*, a comparative study. *Bot. Gaz.* 96: 93–117.
- _____ 1939. Ontogenetic and anatomical studies of the flower and fruit of the Fagaceae and Juglandaceae. *Bot. Gaz.* 101: 301–327.
- Leaf, G., I. Gardner & G. Bond. 1959. Observations on the composition and metabolism of the nitrogen-fixing nodules of *Myrica*. *Biochem. Jour.* 72: 662–667.
- Lebegue, A. 1956. Embryogenie des Urticees. Developpement de l'embryon chez l'*Urtica dioica*. *Compt. Rend. Acad. Sci., Paris* 242: 923–926.
- Lebreton, P. 1964a. Elements de chimiotaxonomie botanique. I. Generalites; notion d'especie biochimique; cas des flavonoides chez *Humulus lupulus* L. *Bull. Soc. Bot. France* 111: 69–80.
- _____ 1964b. *Ibid.* II. Cas de flavonoides chez les Urticales; conclusions generales. *Ibid.* 111: 80–93.
- LeCoq, C. 1963. Contribution a l'etude cytotaxonomique de Moracees et de Urticees. *Rev. Gen. Bot.* 70: 385–426.
- Leins, P. & C. Orth. 1979. Zur Entwicklungsgeschichte mannlicher bluten von *Humulus lupulus* (Cannabaceae). *Bot. Jahrb. Syst.* 100: 372–378.
- Lerner, M. 1963. Marihuana: tetrahydrocannabinol and related compounds. *Science* 140: 175–176.
- Leroy, J. F. 1949. De la morphologie florale et de la classification des Myricacees. *Compt. Rend. Acad. Sci. Paris* 229: 1162–1163.
- _____ 1955. Etude sur la Juglandacees. A la recherche d'une conception morphologique de la fleur femelle et du fruit. *Mem. Mus. Hist. Nat. Paris Bot.* II. 6: 1–246.
- Li, H. 1957. The origin and history of the cultivated plane-trees. *Morris Arbor. Bull.* 8: 3–9; 26–31.
- Little, E. L. 1943. Notes on the nomenclature of *Carya* Nutt. *Am. Midl. Nat.* 29: 493–508.
- _____ 1971. Atlas of United States Trees. Vol. 1. Conifers and Important Hardwoods. U. S. Dept. Agric. Forest Serv. Misc. Publ. 1146, 11 pp. + 200 maps.
- MacDonald, A. 1974. Theoretical problems of interpreting floral organogenesis of *Laportea canadensis*. *Canad. Jour. Bot.* 52: 639–644.
- MacFarlane, W. V. 1963. The stinging properties of *Laportea*. *Econ. Bot.* 17: 303–311.
- MacKay, E. L. 1939. Sex chromosomes of *Cannabis sativa*. *Am. Jour. Bot.* 26: 707–708.
- Mackintosh, A., & G. Bond. 1970. Diversity in the nodular endophytes in *Alnus* and *Myrica*. *Phyton, Buenos Aires* 27: 79–90.
- Malmo, B. 1958. Hamamelidaceae. *Arbor. Bull.* 21: 3–6; 30–31.
- Manning, W. E. 1938. The morphology of the flowers of Juglandaceae. I. The inflorescence. *Am. Jour. Bot.* 25: 407–419.
- _____ II. 1941. The pistillate flowers and fruits. *Ibid.* 28: 839–852. III. 1948. The staminate flowers. *Ibid.* 35: 606–621.
- _____ 1948. A hybrid between shagbark and bitternut hickory in southeastern Vermont. *Rhodora* 50: 60–62.
- _____ 1949a. The status of *Hicoria borealis* Ashe. *Rhodora* 51: 85–89.
- _____ 1949b. The genus *Carya* in Mexico. *Jour. Arnold Arbor.* 30: 425–432.
- _____ 1950. A key to the hickories north of Virginia, with notes on the two pignuts, *Carya glabra* and *C. ovalis*. *Rhodora* 52: 188–199.
- _____ 1973a. The northern limit of the distribution of the mockernut hickory. *Mich. Bot.* 12: 203–209.
- _____ 1973b. The northern limits of the distributions of hickories in New England. *Rhodora* 75: 34–51.
- Martin, L. D. Smith & C. Farmilo. 1961. Essential oil from fresh *Cannabis sativa* and its use in identification. *Nature* 191: 774–776.
- Martindale, D. 1958. Silvical characteristics of sweetgum (*Liquidambar styraciflua* L.). U. S. Dept. Agric. Forest Serv. Southeastern Exp. Sta. Paper 90, 14 pp.
- Massey, A. 1925. Antagonism of the walnuts (*Juglans nigra* L. and *Juglans cinerea* L.) in certain plant associations. *Phytopathology* 15: 773–784.
- McPhee, H. C. 1924. the influence of environment on sex in hemp, *Cannabis sativa* L. *Jour. Agric. Res.* 28: 1067–1080.

- Medvedev, P. F. 1958. On the economic and biological significance of dioecious specimens of *Urtica dioica* L. Bot. Zhur. 43: 1704–1707. [In Russian]
- Melchior, H. 1964. Ulmaceae. In: Engler, Syll. Pflanz., ed. 12, 2: 52–54. Urticaceae. 2: 57–59.
- Metcalf, C. R. 1942. Economic value of the common stinging nettle. Nature 150: 83.
- Miller, N. G. 1970. The genera of the Cannabaceae in the southeastern United States. Jour. Arnold Arbor. 51: 185–203.
- _____. 1971. The genera of the Urticaceae in the southeastern United States. Jour. Arnold Arbor. 52: 40–68.
- Modilevsky, J. 1908. Zur Samenentwicklung einiger Urticifloren. Flora 98: 423–470.
- Mohan-Ram, H. Y. 1960. Occurrence of endosperm haustorium in *Cannabis sativa* L. Ann. Bot. II. 24: 79–82.
- _____. & R. Nath. 1964. the morphology and embryology of *Cannabis sativa* Linn. Phytomorphology 14: 414–429.
- Mohana Rao, P. 1974. Seed anatomy in some Hamamelidaceae and phylogeny. Phytomorphology 24: 113–139.
- Moore, L. A., Jr. 1969. Marijuana (*Cannabis*) Bibliography 1960–1968. Bruin Humanist Forum, Los Angeles, 55 pp.
- Morvillez, F. 1919. L'appareil conducteur foliaire des Hamamelidacees et des formes voisines. Compt. Rend. Sci. Paris 169: 542–545.
- Motegi, T. 1965. Some observations on sex chromosomes and sex expression in *Humulus japonicus*. Sci. Rep. Tohoku Univ. Biol. 31: 7–16.
- Muller, C. H. 1939. Mechanically initiated bark growth in *Celtis*. Am. Midl. Nat. 22: 436–437.
- _____. 1969. Allelopathy as a factor in ecological process. Vegetatio 18: 348–357.
- Muroga, T. 1951. Process of flower bud differentiation in the hop plant. Sci. bull. Fac. Agric. Kyushu Univ. 13: 20–25. [In Japanese with English summary]
- Murrill, W. 1946. Florida hickories. Quart. Jour. Florida Acad. Sci. 9: 115–122.
- Nagel, K. 1914. Studien über die Familie der Juglandaceen. Bot. Jahrb. 50: 459–530.
- Nakai, T. 1927. *Morus alba* and its allies, in the herbaria of Linnaeus, Thunberg and others. Jour. Arnold Arbor. 8: 234–238.
- Nestler, A. 1925. Zur Kenntnis der Wirkung der Brennhaare unsere *Urtica* Arten. Ber. Deutsch. Bot. Ges. 43: 497–504.
- Neumeyer, J., & R. Shagoury. 1971. Chemistry and pharmacology of marijuana. Jour. Pharm. Sci. 60: 1433–1456.
- Neve, R. A. 1956. The place of polyploidy in hop breeding methods. Wye Coll. Dept. Hop Ses. Ann. Rep. 1955: 124–129.
- _____. 1958. Sex chromosomes in the hop, *Humulus lupulus*. Nature 181: 1084–1085.
- Niedenzu, F. 1891. Hamamelidaceae. In: Nat. Pflanz. III. 2a: 115–130.
- Nieuwland, J. 1910. The name of our American wax bayberries. Am. Midl. Nat. 1: 238–243.
- Okabe, S. 1963. Cytological studies of the apomixis in Angiosperms I. Apomixis in the genus *Boehmeria*. Sci. Rep. Tohoku Univ. Biol. 29: 207–215.
- Ono, T. 1955. Studies in hop I. Chromosomes of common hop and its relatives. Bull. Brew. Sci. 2: 1–65.
- Parmentier, P. 1911. Recherches anatomiques et taxonomiques sur les Juglandacees. Rev. Gen. Bot. 23: 341–364.
- Pigott, C. 1964. Nettles as indicators of soil conditions. New Sci. 375: 230–232.
- Planchon, J. E. 1873. Ulmaceae. In: DeCandolle, Prodr. 17: 151–210.
- Priemer, F. 1893. Die anatomischen Verhältnisse der Laubblätter der Ulmaceen (Einschl. Celtideen) und die Beziehungen zu ihrer Systematik. Bot. Jahrb. 17: 419–475.
- Record, S. J. 1929. Walnut woods—true and false. Trop. Woods 18: 4–29.
- _____. & R. Hess. 1940. American woods of the family Moraceae. Trop. Woods 61: 11–54.
- _____. 1943. Timbers of the New World. New Haven, 640 pp.
- Reed, C. A. 1945. Hickory species and stock studies at the Plant Industry Station, Beltsville, Md. North. Nut Gr. Assoc. Rep. 35: 88–121.
- Rehder, A. 1928. Abnormal fruits of *Juglans nigra*. Jour. Arnold Arbor. 9: 272–9.
- Reinsch, A. 1889. Über die anatomischen Verhältnisse der Hamamelidaceen mit Rücksicht auf ihrer systematische Gruppierung. Bot. Jahrb. 11: 347–395.
- Rendle, A. B. 1903. Notes on Myricaceae. Jour. Bot. London 41: 82–87.
- Richens, R. H. 1980. On fine distinctions in *Ulmus*. Taxon 29: 305–312.
- Rivieres, R. 1956. Fleurs et inflorescence de quelques Urticacees. Nat. Monsp. Bot. 8: 189–204.
- _____. 1957. La valeur de la fleur d'Urticacee. Compt. Rend. Acad. Sci. Paris 244: 653–656.
- Rodriguez-Barrueco, C. 1969. The occurrence of nitrogen-fixing root-nodules on non-leguminous plants. Bot. Jour. Linn. Soc. London 62: 77–84.
- Runner, D. K., & F. Smith. 1951. The structure and development of the storage root of *Humulus lupulus* L. (Abstr.) Proc. Oregon Acad. Sci. 2: 80.

- Salle, A. J., G. J. Jann & M. Ordanik. 1949. Lupulin — an antibiotic from the strobiles of *Humulus lupulus*. Proc. Soc. Exper. Med. 70: 409–411.
- Salmon, E., & A. Wormald. 1915. *Humulus americanus* Nuttall. Jour. Bot. 53: 132–135.
- Sargent, C. S. 1891–1902. the Silva of North America...Exclusive of Mexico. 14 vols., Houghton, Mifflin & Co., Boston & New York.
- _____. 1894. The wax-myrtles of the sea-coast of eastern North America. Garden Forest 7: 474–475.
- _____. 1918. Notes on North American trees. II. *Carya*. Bot. Gaz. 66: 229–258.
- Sax, K. 1933a. Chromosome numbers in *Ulmus* and related genera. Jour. Arnold Arbor. 14: 82–84.
- _____. 1933b. Species hybrids in *Platanus* and *Campsis*. Jour. Arnold Arbor. 14: 274–278.
- Schaffner, J. H. 1904. Twigs of the common hackberry. Ohio Nat. 5: 215–216.
- _____. 1923. Sex reversal in Japanese hop. Bull. Torrey Bot. Club 50: 73–79.
- _____. 1931. The fluctuation curve of sex reversal in staminate hemp plants induced by photoperiodicity. Am. Jour. Bot. 18: 424–430.
- Schneck, J. 1897. the hackberries as ornamental and shade trees. Meehan's Monthly 7: 231–232.
- Schoenland, S. 1883. Über die Entwicklung der Blüten und Frucht bei den Platanen. Bot. Jahrb. 4: 308–327.
- Schrieber, A. 1958. Cannabaceae. In: G. Hegi, Illustr. Fl. von Mittel-Europa. ed. 2, 3: 283–295. Urticaceae. 3: 296–307.
- Schultes, R. E. 1969. Hallucinogens of plant origin. Science 163: 245–25.
- _____. 1973. Man and marijuana. Nat. Hist. 82: 58–63, 80, 82.
- _____. W. Klein, T. Plowman & T. Lockwood. 1974. *Cannabis*: an example of taxonomic neglect. Bot. Mus. Leaflet. 23: 337–367.
- Schuster, C. E. 1937. Differences in heterosis of walnut hybrids. Jour. Hered. 28: 216–217.
- Sears, P. B. 1942. Postglacial migration of five forest genera. Am. Jour. Bot. 29: 684–691.
- Seymour, F. C. 1952a. Notes on Moraceae and Ulmaceae. Am. Midl. Nat. 48: 249–250.
- _____. 1952b. The type of *Ulmus americana* L. Rhodora 54: 138–139.
- Shah, A., & P. Kachroo. 1956. Comparative anatomy in Urticales. The trichomes in Moraceae. Jour. Indian Bot. Soc. 54: 138–153.
- Shattuck, C. H. 1905. A morphological study of *Ulmus americana*. Bot. Gaz. 40: 209–223.
- Shuhart, D. V. 1932. Inner sculpturing of the fruit of Juglandaceae. Proc. Okla. Acad. Sci. 12: 17–18.
- Singh, S. P. 1956. Floral anatomy of *Cannabis sativa* L. Agra Univ. Jour. Res. Sci. 5: 155–161.
- Sinoto, Y. 1929. Chromosome studies in some dioecious plants, with special reference to allosomes. Cytologia 1: 109–191.
- Small, E. 1974a. The systematics of *Cannabis*. (Abstr.) Am. Jour. Bot. 61: 50.
- _____. 1974b. American law and the species problem in *Cannabis*. Microgram 7: 131–132.
- _____. H. Beckstead & A. Chan. 1975. The evolution of cannabinoid phenotypes in *Cannabis*. Econ. Bot. 29: 219–232.
- _____. & A. Cronquist. 1976. A practical and natural taxonomy for *Cannabis*. Taxon 25: 405–435.
- _____. P. Jui & L. Lefkovitch. 1976. A numerical taxonomic analysis of *Cannabis* with special reference to species delimitation. Syst. Bot. 1: 67–84.
- _____. 1978. a numerical and nomenclatural analysis of morpho-geographic taxa of *Humulus*. Syst. Bot. 3: 37–76.
- Staub, R. 1967. Some variations in fruit, seed and seedling characteristics in the American elm, *U. americana* L., in relation to geography of seed source. Dissert. Abstr. 28: 511B.
- Stearn, W. 1974. typification of *Cannabis sativa* L. Bot. Mus. Leaflet. 23: 325336.
- Stewart, W. 1967. Nitrogen-fixing plants. Science 158: 1426–1432.
- Steyermarck, J. 1956. Eastern witch hazel. Missouri Bot. Gard. Bull. 44: 99–101.
- Stokes, J. 1937. Cytological studies in the Myricaceae. Bot. Gaz. 99: 387–399.
- Stone, D. E. 1961. Ploidal level and stomatal size in the American hickories. Brittonia 13: 293–302.
- _____. 1963. Pollen size in hickories (*Carya*). Brittonia 15: 208–214.
- _____. 1970. Evolution of cotyledonary and nodal vasculature in the Juglandaceae. Am. Jour. Bot. 57: 1219–1225.
- _____. G. Adrouny & R. Flake. 1969. New World Juglandaceae. II. Hickory nut oils, phenetic similarities and evolutionary implications in the genus *Carya*. Am. Jour. Bot. 56: 928–935.
- Strasburger, E. 1910. Sexuelle und apogame Fortpflanzung bei Urticaceen. Jahrb. Wiss. Bot. 47: 245–288.
- Sweitzer, E. 1971. Comparative anatomy of Ulmaceae. Jour. Arnold Arbor. 52: 523–585.
- Tally, P. 1934. Carbohydrate-nitrogen ratios with respect to the sexual expression of hemp. Plant Physiol. 9: 731–748.
- Taylor, L. A. 1940. Plants used as curatives by certain southeastern tribes. Bot. Museum, Harvard, 99 pp.
- Thieret, J. W. 1966. Habit variation in *Myrica pensylvanica* and *Myrica cerifera*. Castanea 31: 183–185.

- Thurston, E. L., & N. R. Lersten. 1968. The ontogeny and histochemistry of stinging hairs in *Urtica dioica*. (Abstr.) Am. Jour. Bot. 55: 705.
- _____. 1969. The morphology and toxicology of plant stinging hairs. Bot. Rev. 35: 393–412.
- Tippo, O. 1938. Comparative anatomy of the Moraceae and their presumed allies. Bot. Gaz. 100: 1–99.
- Todd, A. R. 1942. The chemistry of hashish. London Roy. Coll. Sci. Jour. 12: 37–45.
- _____. 1943. The hemp drugs. Endeavor 2: 68–72.
- Toffoli, F., U. Avico & E. S. Ciranni. 1968. Methods of distinguishing biologically active cannabis and fibre cannabis. Bull. Narcotics. 20: 55–59.
- Tournois, J. 1914. Etudes sur la sexualite du houblon. Ann. Sci. Nat. Bot. IX. 19: 49–191.
- Townsend, C. C. 1968. *Parietaria officinalis* and *P. judaica*. Watsonia 6: 365370.
- Trelease, W. 1896. Juglandaceae of the United States. Missouri Bot. Gard. Rep. 7: 25–46.
- Venkataraman, K. 1972. Wood phenolics in the chemotaxonomy of the Moraceae. Phytochemistry 11: 1571–1586.
- Vikhireva, B. 1957. Anatomical structure and development of the pistillate blossom of sweetgale, *Myrica gale* L. Acta Inst. Bot. Acad. Sci. URSS 7. Morphol. Anat. Pl. 4: 270–287. [In Russian]
- Walker, R. I. 1932. Chromosome numbers in *Ulmus*. Science 75: 107.
- Ward, L. 1888. The paleontologic history of the genus *Platanus*. Proc. U. S. Nat. Mus. 11: 39–42.
- Weddell, H. A. 1854. Revue de la famille des Urticees. Ann. Sci. Nat. Bot. IV. 1: 173–212.
- _____. 1856. Monographie de la famille des Urticees. Arch. Mus. Hist. Nat., Paris 9: 1–400; 401–592.
- Weil, A. T., N. E. Zinberg, & J. M. Nelson. 1968. Clinical and psychological effects of marihuana in man. Science 162: 1234–1242.
- Westergaard, M. 1958. The mechanism of sex determination in dioecious flowering plants. Adv. in Genet. 9: 217–281.
- Weston, E. W. 1960. Changes in sex in the hop caused by plant growth substances. Nature 188: 81–82.
- Wettstein, R. 1925. Fakultativ Parthenogenesis beim Hopfen (*Humulus lupulus*). Flora 118/119: 600–604.
- Williams, L. 1958. Bayberry wax and bayberries. Econ. Bot. 12: 103.
- Wolf, F. A. 1910. Formation of adventitious roots by the hackberry tree. Pl. World. 13: 174–175.
- Woodland, D. W. 1974. Cytological and phenolic relationships in the genus *Urtica*. Am. Jour. Bot. 61: 69.
- _____. 1980. Noteworthy collections. *Urtica dioica* L. subsp. *dioica*, subsp. *holosericea* (Nutt.) Thorne and *U. urens* L. (Urticaceae). Madroño 27: 144–145.
- _____. 1982. Biosystematics of the perennial North American taxa of *Urtica*. II. Taxonomy. Syst. Bot. 7: 282–290.
- _____. I. Bassett, C. Crompton & S. Forget. 1982. Biosystematics of the perennial North American taxa of *Urtica*. I. Chromosome number, hybridization and palynology. Syst. Bot. 57: 269–281.
- Wyman, D. 1951. Elms grown in America. Arnoldia 11: 79–93.
- Youngken, H. 1919. The comparative morphology, taxonomy and distribution of the Myricaceae of the eastern United States. Am. Jour. Pharm. 87: 391–398.
- Ziegler, H. 1960. “Rhizomthamnen” bie *Comptonia peregrina* (L.) Coult. Naturwiss. 47: 113–114.

INDEX TO LATIN NAMES

Note: Boldface indicates a name used in this treatment for a species known to occur in the wild in New York State.

Adicea		Humulus	
fontana	38	americanus	22
opaca	38	japonicus	21
pumila	40	lupulus	22
Angeia		scandens	21
palustris	59	Juglans	
Antidesma		alba	50
scandens	21	cinerea	42
Boehmeria		cordiformis	47
cylindrica	31	laciniosa	48
drummondiana	31	nigra	44
scabra	31	obcordata	53
Broussonetia		ovalis	53
papyrifera	26	regia	45
Cannabis		tomentosa	50
sativa (& synonyms)	18	Laportea	
Carya		canadensis	32
alba	50	Liquidambar	
borealis	53	aspleniifolia	57
carolinae-septentrionalis	55	formosana	4
cordiformis	47	macrophylla	4
× dunbari	56	orientalis	4
glabra	52	peregrina	57
illinoensis	46	styraciflua	4
laciniosa	48	Maclura	
× laneyi	56	aurantiaca	24
leiodermis	52	pomifera	24
megacarpa	53	Morella	
microcarpa	53	caroliniensis	60
ovalis	53	Morus	
ovata	55	alba	27
tomentosa	50	nigra	27
Celtis		papyrifera	26
canina	16	rubra	28
crassifolia	16	tatarica	27
laevigata	16	Myrica	
occidentalis	16	aspleniifolia	57
pumila	16	caroliniensis	60
Cerothamnus		cerifera	61
caroliniensis	60	gale	59
Comptonia		heterophylla	61
aspleniifolia	57	× macfarlanei	61
peregrina	57	palustris	59
Gale		pensylvanica	60
palustris	59	peregrina	57
Hicoria (see Carya)		Papyrius	
Hamamelis		papyrifera	26
macrophylla	5		
vernalis	5		
virginiana	5		

Parietaria			
judaica	34	montana	13
obtusa	33	parviflora	14
officinalis	34	procera	14
pensylvanica	33	pubescens	12
Pilea		pumila	11
deamii	40	racemosa	10
fontana	38	rubra	12
opaca	38	scabra	13
pumila	40	surculosa	14
Platanus		thomasi	10
× acerifolia	3	Urtica	
× hybrida	3	canadensis	32
mexicana	1	chamaedryoides	38
occidentalis	1	cylindrica	31
racemosa	1	dioica	36
wrightii	1	divaricata	32
Toxylon		lyallii	37
pomifera	24	gracilis	37
Ulmus		platyphylla	38
alba	8	procera	37
americana	8	pubescens	37
campestris	13	pumila	40
elliptica	12	urens	35
fulva	12	Urticastrum	
glabra	13	divaricatum	32
hayderi	12	Wallia	
× hollandica	15	cinerea	42
laevis	9	nigra	44

New York Botanical Garden Library
3 5185 00337 3618



ISSN 0278-3355
ISBN 1-55557-177-8